CANADIAN MACHINERY AND MANUFACTURING

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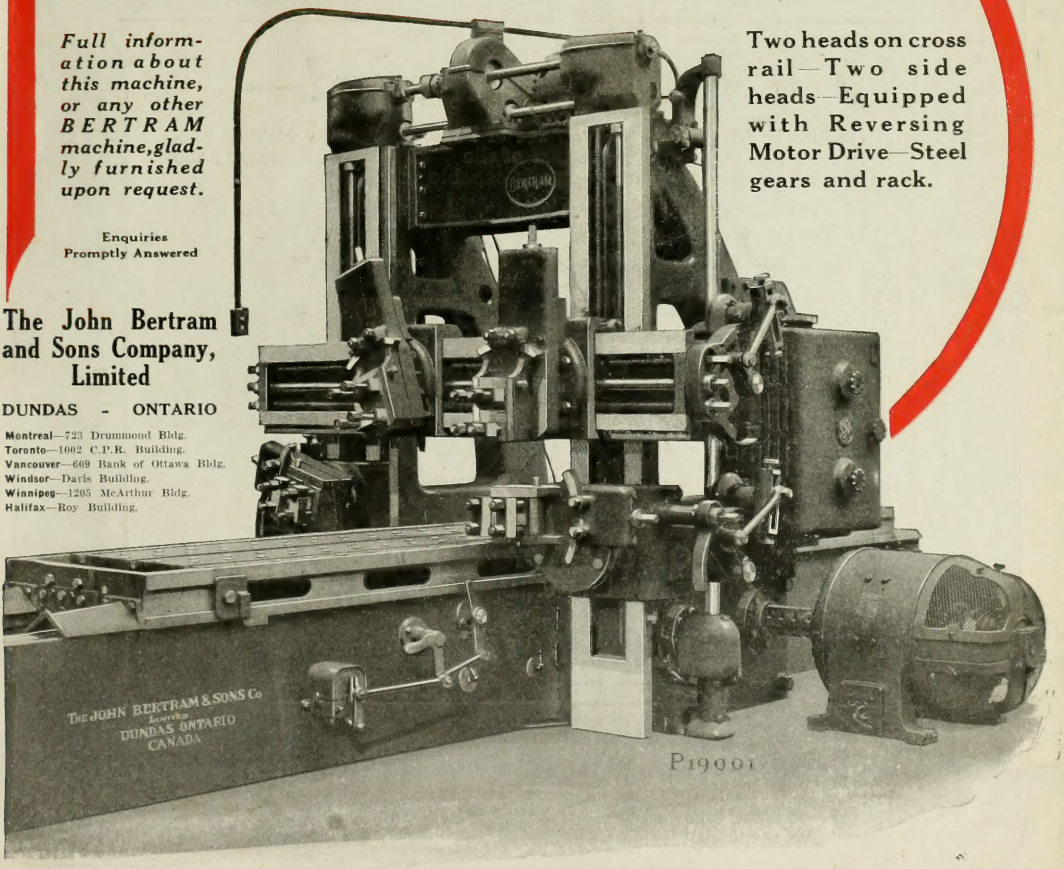
BERTRAM MACHINE TOOLS

42" x 42" SPECIAL PLANER

Full information about this machine, or any other BERTRAM machine, gladly furnished upon request.

Enquiries Promptly Answered

Two heads on cross rail—Two side heads—Equipped with Reversing Motor Drive—Steel gears and rack.



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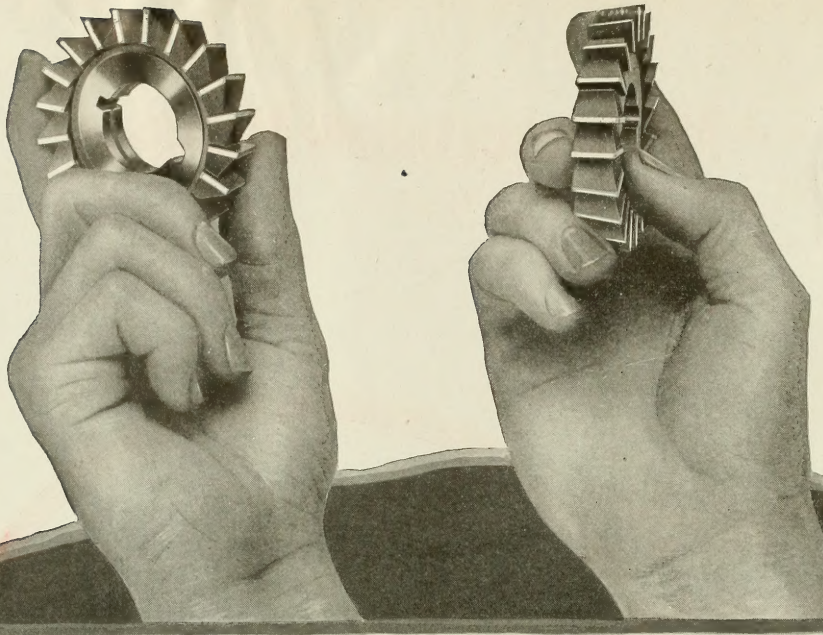

If it's speed you need—

One trial will prove the advantage of Pratt & Whitney Milling Cutters. No matter what the nature of the work they will give you the highest production the machine is capable of.

They're designed for free, fast cutting. And tempered and seasoned to last longer.

PRATT & WHITNEY MILLING CUTTERS

Ask us for prices and details on Plain Milling Cutters, Side Milling Cutters, Inserted Blade End and Side Cutters, Screw Slot Cutters, Coarse Tooth Side or Plain Milling Cutters, Involute Gear Cutters, Concave, Convex and Double Angle Cutters, Cutters for Spiral Mills, Roll Thread Die Hobs, Key-Seating and Slotting Cutters, Straight and Spiral Cut End Mills (B. & S. and M. T. Shank), Spiral and Straight Shell End Mills, etc.

And we make formed cutters for special work also. All are backed by the guarantee for goodness that the P. & W. trademark indicates.

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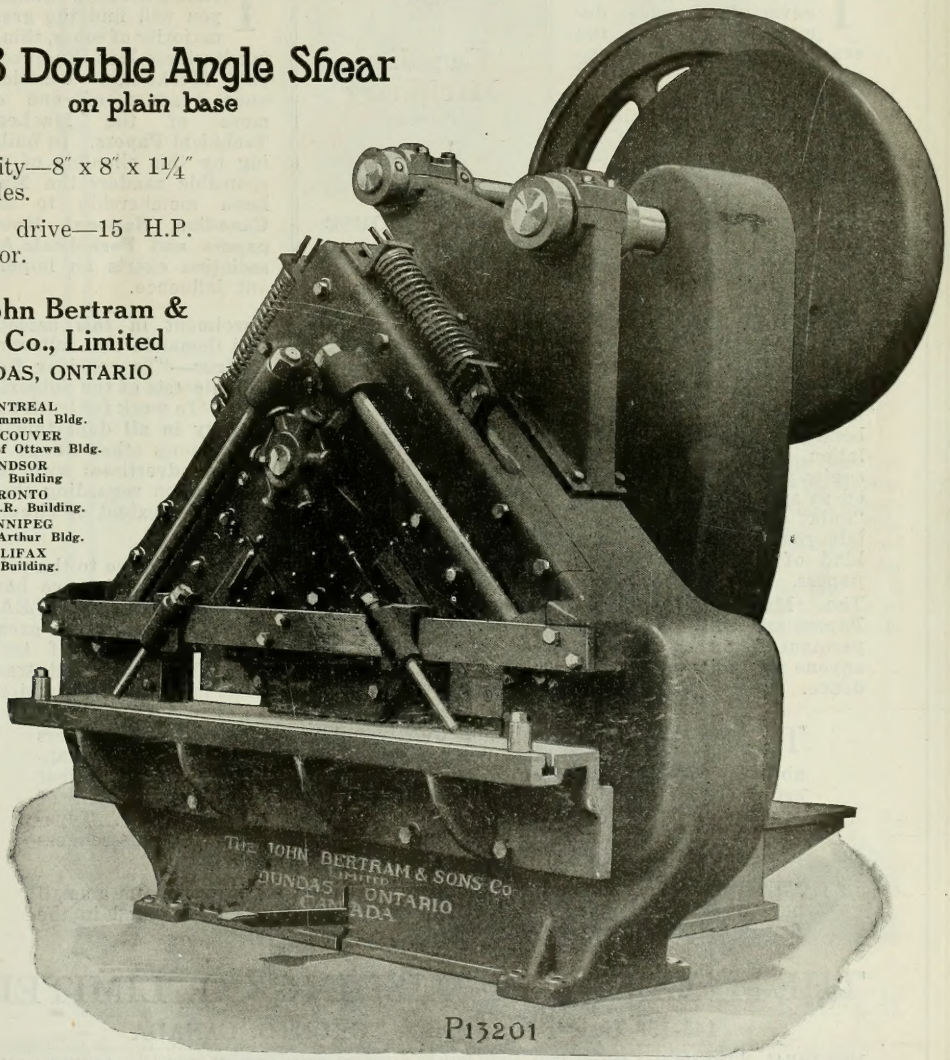
The BERTRAM Page

MACHINE TOOLS

No. 8 Double Angle Shear
on plain base

Capacity—8″ x 8″ x 1¼″ angles.

Motor drive—15 H.P. Motor.



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The Facts are in Demand

THE careful buyer of advertising space demands to know the exact quality and quantity of circulation of the medium he has under consideration. Mere claims won't do any more. Cold facts must be produced—facts beyond the shadow of doubt.

Advertisers who place their messages through the columns of the MacLean Technical Papers find they get both quality and quantity circulation.

Both of these facts are actually proven by the Audit Bureau of Circulations. This A.B.C. statement counts only bona-fide, paid-for circulation. It refuses to include copies printed and distributed as specimen copies or as "bulk" subscriptions, and it tells you definitely just what kind of people read these papers.

The MacLean Technical Papers are well established. permanent powers to which anyone may turn with confidence.

Canadian Machinery
(Weekly)

Power House
(Semi-Monthly)

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(Monthly)

Marine Engineering
(Monthly)

Pledges of Truth Required

THROUGHOUT Canada you will find the great majority of sober, thinking Business Men, Engineers and Mechanics, conscientious readers of one or more of the MacLean Technical Papers. In building up this clientele of responsible readers the MacLean membership to the **Canadian National Newspapers and Periodicals Association** exerts an important influence.

Enrolment in this association demands the following pledges—"To consider first the interests of the Subscriber." "To work for truth and honesty in all departments, and among other things to supply advertisers with full information regarding character and extent of circulation."

Rigid adherence to the principles set forth above have resulted in the MACLEAN papers becoming the greatest disseminators of technical information and trade news in the British Empire.

THE monthly, semi-monthly and weekly publishing of the four papers listed above is a task that demands the utmost from a thoroughly capable organization. Technical men with years of practical experience present articles and editorials of a "better business" nature. Advertising men of proven ability plan campaigns and assist in the preparation of copy. Typesetters, press operators, proof readers, artists and even the messengers work with the all impelling incentive of better accomplishment.

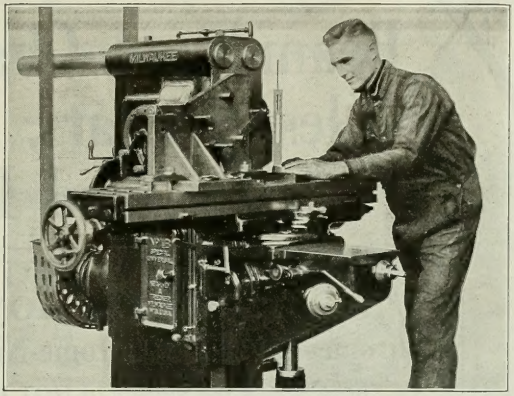
To this spirit of splendid co-operation is credited the growth from a small beginning to what is now the largest publishing business of its kind in the British Empire.

THE MACLEAN PUBLISHING CO., LIMITED

143-153 University Avenue, TORONTO, CANADA

MONTREAL, WINNIPEG, VANCOUVER, NEW YORK, BOSTON, CHICAGO, CLEVELAND, LONDON, ENG.

MILWAUKEE MILLING MACHINES



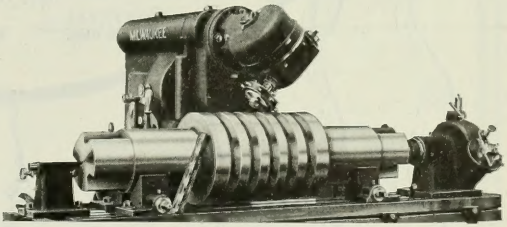
Efficient on Light and Heavy Milling

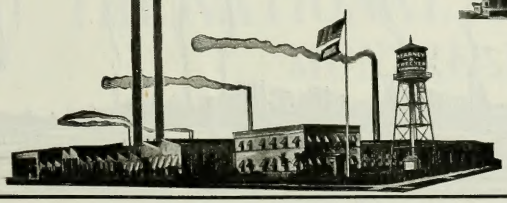
Heavy milling jobs are not unknown to Milwaukee Universal Milling Machines, while delicate and intricate ones are efficiently performed with little effort.

Both light and heavy milling operations are handled with such smoothness and accuracy that the finest results are obtained. Because Milwaukee Universal Milling Machines perform such a wide variety of work, they are particularly well adapted for the tool-room.

The jobs shown in the two illustrations are representative of "Milwaukee" adaptability. The upper illustration shows a jig being bored with a fly cutter. The lower illustrates the milling of a chilled roll with the use of a Universal Milling Attachment.

Write for Catalogue—NOW.





KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WIS., U.S.A.

Canadian Representatives: Williams and Wilson, Ltd., Montreal; F. F. Barber Machy. Co., Toronto; A. R. Williams Machy. Co., Vancouver and Winnipeg

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Chrome-Vanadium, Chrome-Nickel, Nickel

All These Steels We Supply in HOT ROLLED BARS

We Also Furnish in
BLOOM, BILLET AND SLAB FORM

Sulphuric Acid Nitre Cake

The Quality of ALGOMA Open Hearth Steel is traditional for its quality throughout Canada. You can rely upon it on every occasion

ALGOMA

Steel Corporation, Limited

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NAMCO

SCREWS - NUTS

—and STUDS

Our stock includes all the popular sizes of S.A.E. and U.S.S. Cap and Set Screws and Plain and Castellated Nuts.

Studs and Hex. Brass Nuts and Nurls are also shipped promptly.

Specials

to sample or blue-print in sizes up to 2¼″ diameter are made up promptly. Hardened and ground product to specifications.

THE NATIONAL ACME COMPANY
MONTREAL, P. Q.

De Courcelles G.T.R.R.

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IRON ORE - PIG IRON

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DROP FORGINGS

Are sometimes cheaper than castings—Always far superior.

DROP FORGINGS

One of the Largest and Best Equipped Plants anywhere.

Consult us as to your requirements.

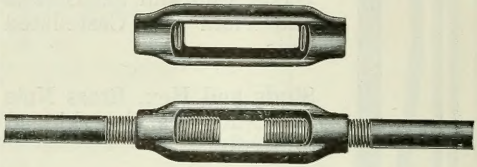
Dominion Forge & Stamping Co., Limited

Walkerville, Ontario

Toronto Office - Excelsior Life Building

CANADA FOUNDRIES & FORGINGS LIMITED

Drop Forged Steel



SOLID—NOT WELDED

16 Sizes with / without Stubs

Canada Foundries & Forgings

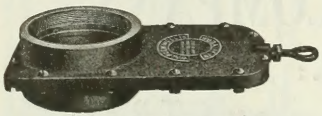
Welland, Ont.

3 FOR 1

Indianapolis, Ind.

The **6" blast gate** furnished by you has proven entirely satisfactory. It is **answering the purpose of an 8" gate valve,** which would **cost several times as much as a blast gate.**

THE BAUR CARBONIC COMPANY,
(Signed) Oscar Baur, Pres.



NEW AIR-TIGHT BLAST GATE

Light, Strong, Compact, Inexpensive, Quick-Acting.

You have the same opportunity to save practically two-thirds of what you now pay for gate valves.

Low in first cost and upkeep, easily and quickly operated, affording the full area of the pipe—these and other advantages make our New Air-Tight Blast Gate an ideal substitute for heavy, cumbersome, expensive and slow-acting gate valves.

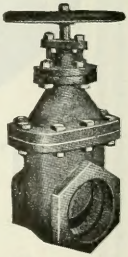
This new **Air-Tight Blast Gate** is made in sizes from 2" to 16", threaded and flanged. Descriptive circular 210-T gives detail dimensions of all sizes. Write for copy to Canadian branch.

W. S. ROCKWELL COMPANY

Furnace Engineers and Contractors

50 CHURCH ST. (Hudson Terminal Building), NEW YORK

Canadian Distributors: Drummond, McCall & Co. Limited, Montreal



GATE VALVE

Heavy, Cumbersome, Expensive, Slow-Acting.

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BANFIELD

During recent years this company was compelled to decline much desirable business and many connections that would have been highly appreciated, for enquiries could not be considered without prejudice to the important Government work entrusted to us.

Present conditions suggest an opportunity for you to establish connections with a concern whose manufacturing facilities are not excelled in this country, and whose record on the important matter of service makes such a connection a real asset.

W. H. Banfield & Sons, Limited - Toronto

STAMPINGS

ELK

BRAND

FIRE BRICKS

FOR

Quality and Service

Remember—we make several qualities of Fire Brick. all perfectly adaptable to the purpose for which they are intended. Now, here is where our Service stands you in good stead: we recommend the class of brick particularly suitable for your purpose. In other words, we do not sell you a costly high-class brick when another class of brick suits just as well.

Our Various Brands

"Elkco"	"Keystone"	"Elk Dust"
"Elkco" Special	"M. D. Elk"	"Keystone Dust"
"Elk Steel"	"Rotex"	"Rotex Dust"
"St. Marys"	"Elk Ladle"	

When you select Elk Brand Fire Bricks you know you are getting the right quality. Our warehouse is well stocked to supply your immediate needs.

ELK FIRE BRICK CO. OF CANADA
LIMITED
Sun Life Building, HAMILTON, ONTARIO

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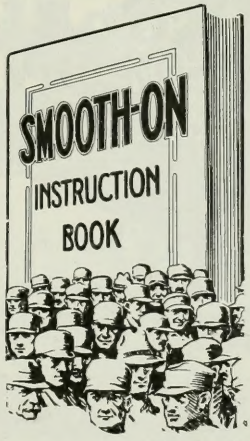
What Other Engineers KNOW About Repair Work, This Free Book Tells YOU

It is full from cover to cover of practical ideas developed to meet actual emergencies. There is no theory in the



SMOOTH-ON Instruction Book

Its 144 pages of **real facts** — facts that — if you knew them—might save you hours — or days — and dollars in your next repair job.

Write for it to-day— It's FREE

SMOOTH-ON MFG. CO.
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San Francisco Office:
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Canadian Distributors:
CANADIAN ASBESTOS Co., Montreal, Toronto, Canada.

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THE JOHNSON FRICTION CLUTCH

The Case Against the Countershaft

The old familiar countershaft drive, through cross belts and tight and loose pulleys, stands accused of the following offences against efficiency.

In that it—

1. Involves needless equipment.
2. Costs too much to set up.
3. Prevents economical and systematic use of space.
4. Operates sluggishly.
5. Multiplies belt troubles and the resultant cost of upkeep.

Modern practice has discarded the antiquated countershaft for the simplicity and efficiency of the clutch drive direct from lineshaft.

Adopt the Johnston Lineshaft Drive

The economical, efficient and durable method of power transmission through friction control.

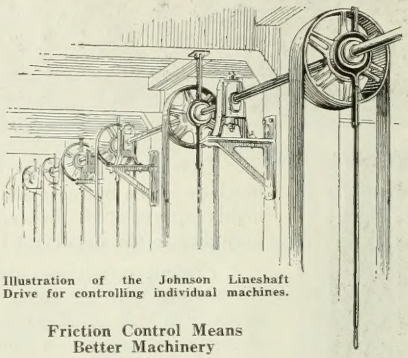
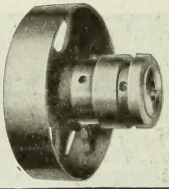


Illustration of the Johnson Lineshaft Drive for controlling individual machines.

Friction Control Means Better Machinery

Whether it is applied overhead or in the machine itself.

Write for our Booklet "Clutches as Applied to Machine Building" and our Yellow Catalog.



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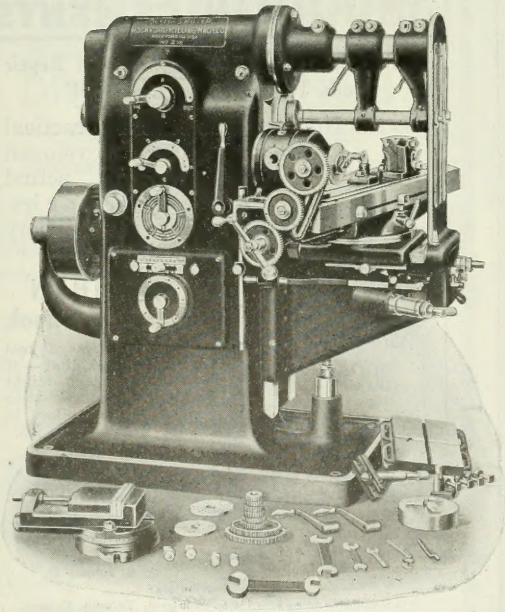
CANADIAN FAIRBANKS-MORSE CO., LTD., Montreal, Toronto, Winnipeg

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.

For work requiring the utmost accuracy—



ROCKFORD MILLERS

have established an enviable reputation among prominent manufacturers for accuracy, simplicity in construction and ease of operation. That they have been able to do this is credited to the great care exercised in their design, and the high-grade workmanship used in their construction.

All feeds on the Rockford are controlled by one lever — the main spindle is instantly adjustable by a single nut, and the operator can complete a job without leaving the front of his machine. These are a few of the points that have made the Rockford a favorite with the men as well as their employers. We would like to tell you more about these machines. Write us for full information.

Rockford Milling Machine Co.
Rockford, Ill.

Canada: Rudel-Belnap Machinery Co.
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O. H. STEEL	FERRO-ALLOYS		TRACKWORK
	MANGANESE-STEEL	OTHER ALLOYS	
Bolsters			Diamond Crossings
Couplers			Crosses
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Wheel Centres	Special Trackwork	Roll Shells	Complete Intersection

This list is merely an indication

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Transportation Building, Montreal

WE CAN SUPPLY

STEEL PLATE

—IN—

Universal Edge - up to 40 in. wide

Sheared Edge - up to 60 in. wide

Any Thickness **Any Lengths**

Send Us Your Enquiries.

Dominion Foundries & Steel, Limited
HAMILTON, ONTARIO

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LEVIATHAN AND ANACONDA
ELEVATING TRANSMITTING CONVEYING
BELTING

BELTING

That ensures a big measure of efficient and economical

SERVICE

We carry in stock Leviathan and Anaconda Belting, from 1" up, all plies, and are prepared to supply any length of belt at any time whether for conveying, elevating or transmission.

The belting comes in rolls of 500 ft., but we can supply any portion of this or one or more rolls at a moment's notice. Stocks carried at all points given in addresses below.

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EDMONTON and CALGARY
Gorman, Clancey & Grindley - Edmonton, Alberta

HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

Twist Drills, Taps, Hack Saw Blades, Milling Cutters, Files, Etc.; Music Wire for Springs, Steel Balls, Cold Rolled Tool Steel in Strips and Sheets, Circular Saws, Machine Knives.

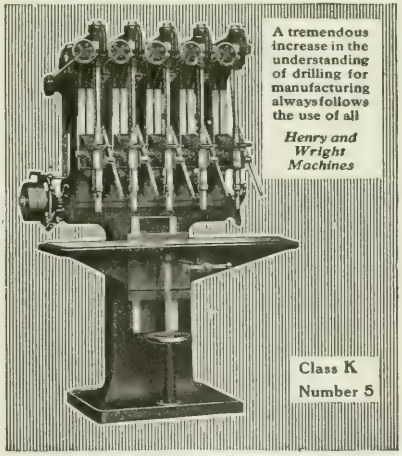
PILOT STEEL & TOOL COMPANY,
LIMITED
332 St. James Street, Montreal

Sole Agents for

JONAS & COLVER, LIMITED
Novo and Continental Steel Works
Sheffield, Eng.

H. BOKER & CO., Inc.
New York, N.Y.

HENRY & WRIGHT
Drilling Machines


A tremendous increase in the understanding of drilling for manufacturing always follows the use of all
Henry and Wright Machines
Class K
Number 5

The Henry & Wright Mfg. Co.
Hartford, Conn.
New York Office: 136 Cedar Street

Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co, Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.

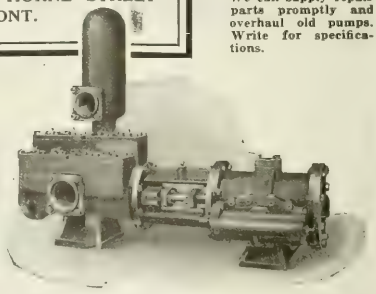
HEPBURN
PUMPS

A Lesson in Economy

Do you want a real Lesson in Pump Economy? Then go watch a Hepburn Patent Feed Pump in operation. The long, regular strokes will reveal the efficiency of the pump. The self-draining feature and the absence of levers and tappets requiring adjustment make the Hepburn the most desirable pump for many purposes.

JOHN T. HEPBURN, Limited
Engineers and Iron Founders
18-60 VAN HORNE STREET
TORONTO, ONT.

We can supply repair parts promptly and overhaul old pumps. Write for specifications.



Other Hepburn Products are Vertical Engines, Compressors, Winches, Cut Gears, Cranes, Derricks, Brick Machinery, Hydrants, Blacksmith Work and Acetylene Welding. Prices and workmanship will be right.

LA SALLE

Has an Advantage Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.

American Drill Grinder
For Wet or Dry Drill Grinding ⅛" to 2¼". Also ⅛" to 3½" dia.

LA SALLE TOOL CO.
La Salle, Illinois, U.S.A.

Represented in Canada by
A. R. Williams Machinery Co., Ltd.
64-66 Front Street W., Toronto
Halifax St. John, N.B. Monreal Winnipeg Vancouver

WHY EXPERIMENT ?
WE DID IT FOR YOU YEARS AGO

IMPERIAL GENUINE

For Heavy Engines and Extraordinary Hard Work

HARRIS HEAVY PRESSURE

THE COPPER COATED CAKE

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.

Matchless

Suitable For Slow-Moving Bearings
Write For Prices

THE CANADA METAL CO., LIMITED
TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER

STEEL *for*
Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Co., Limited

Head Offices:
New Glasgow, N.S.

Sales Offices:
Western Room 14 Windsor Hotel
MONTREAL

Steel Ingots
by the
HARMET
Liquid Process

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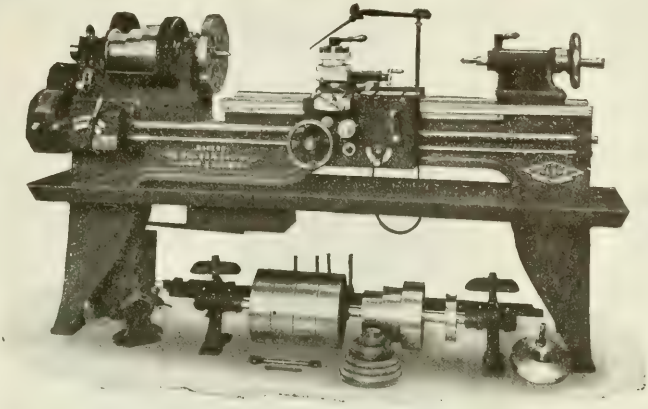
The "SELSON" High-Speed, Vee Bed Gap Lathe

13" Swing



We have designed the Selson 13-inch Lathe specially for the Canadian market.

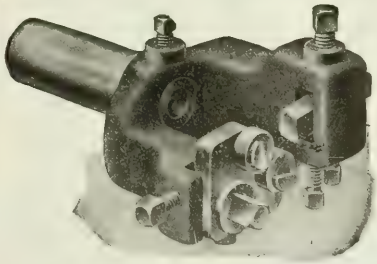
SELSON

Engineering Co., Ltd.

SELSON HOUSE, 83 and 85 QUEEN VICTORIA STREET
LONDON, E.C.4, ENGLAND. WORKS: COVENTRY

Branches: Paris, Brussels, Turin, Milan, Melbourne, New York

TURRET-LATHE TOOLS & HOLDERS



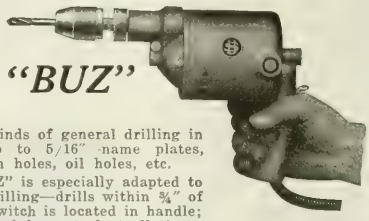
COMPLETE EQUIPMENT FOR CAPSTAN LATHES FULLY ILLUSTRATED IN OUR TOOL LIST E.

Sales Agents Wanted

J. ACKWORTHIE LTD.
COLESHILL STREET,
BIRMINGHAM
ENGLAND

United States Electric Drills and Grinders

The "BUZ"



For all kinds of general drilling in metal up to 5/16" -name plates, cotter pin holes, oil holes, etc.

The "BUZ" is especially adapted to corner drilling—drills within ¾" of corner. Switch is located in handle; under absolute control at all times. Attaches to any lamp socket, alternating or direct current, 110 or 220 volts. Guaranteed the most powerful electric drill of its weight on the market.

Order a few to-day for trial. Their time and labor saving ability will convince you you need more!

For Sale By
The Canadian Fairbanks-Morse Co., Limited
Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.
CINCINNATI, OHIO

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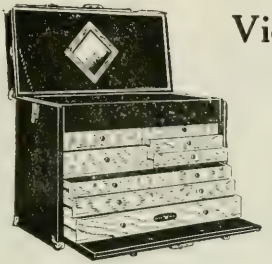

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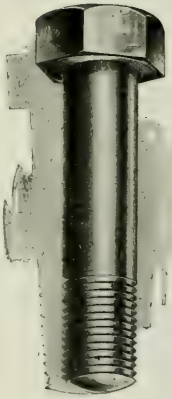

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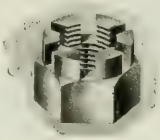

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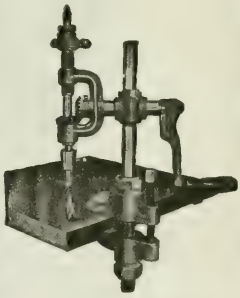

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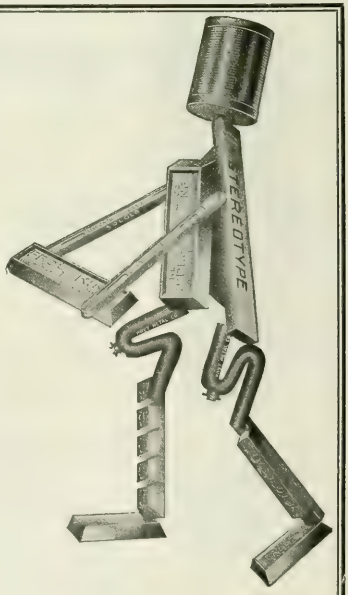

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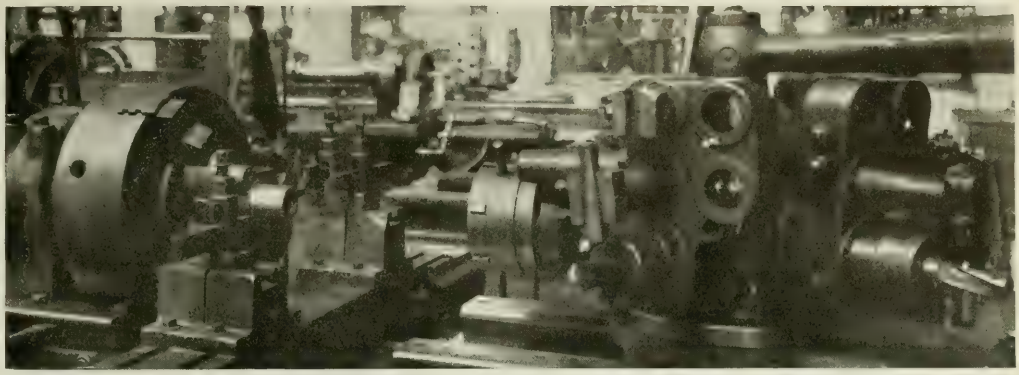

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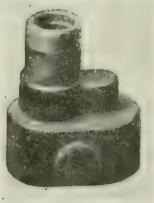

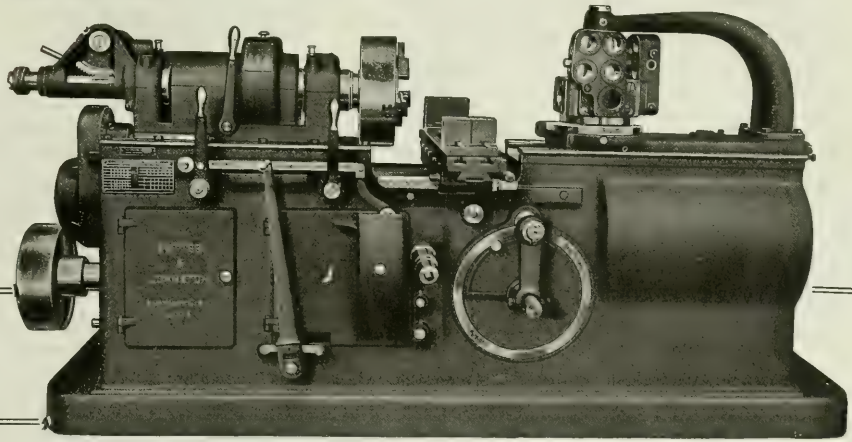

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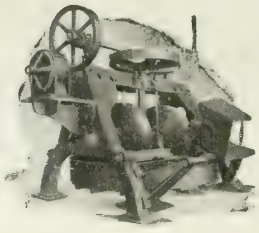

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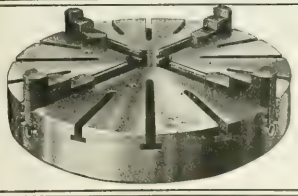

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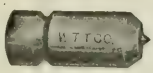

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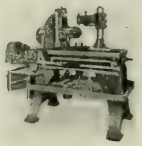

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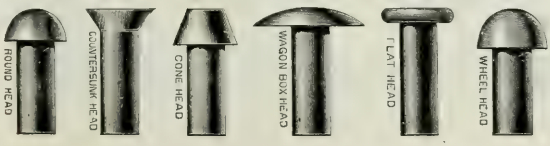

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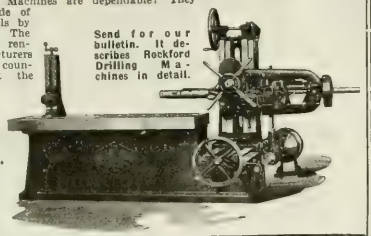

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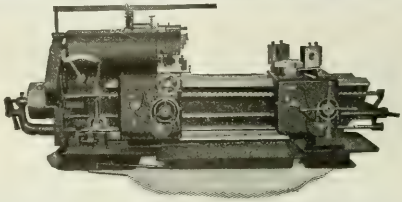

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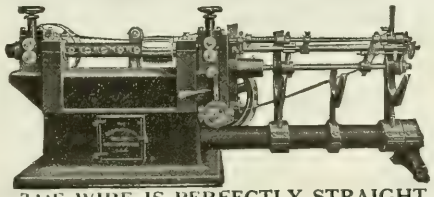

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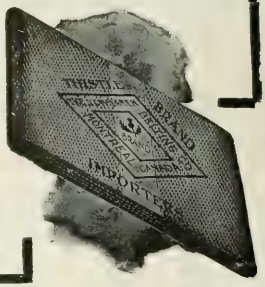

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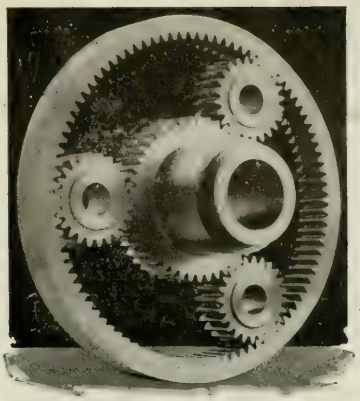

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Name of firm and full address.

Description of shop and equipment.

Particulars regarding regular line, if any.

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This information will be filed and other necessary particulars forwarded to American manufacturers who are likely to be interested.

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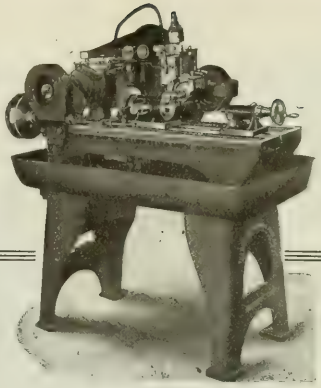

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16 and 20 inch

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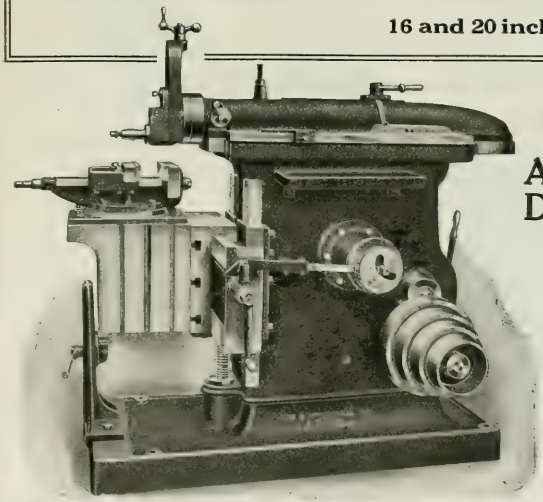

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is made possible with McDougall Crank Shapers than with any ordinary Shaper because the McDougall is built on lines especially for this purpose. It embodies the most approved features of the most practical shapers on the market and care has been taken to exclude all non-essential parts.

The column is massive in construction, well braced and reinforced internally. Exceptional strength is also seen in the ram, which is semi-circular in form and of box type. It can be set forward by crank conveniently arranged.

Slides are square, accurately fitted and with broad bearing surfaces.

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Because of the Positive, No-Shock, Independent Action of the Indexing Mechanism

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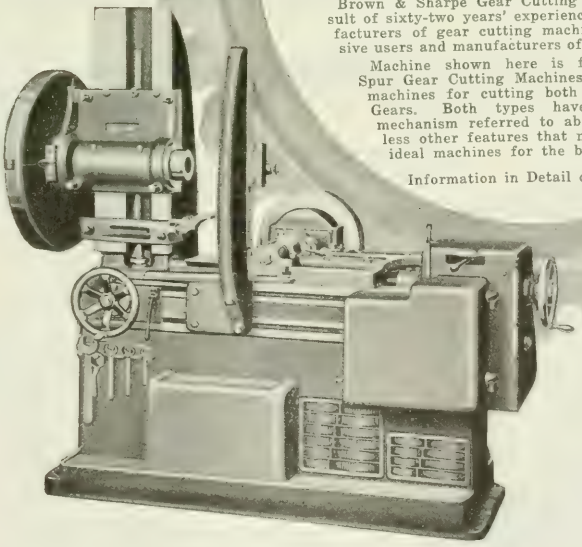
The indexing mechanism acts independently of feed and speed of cutter, resulting in a constant, high speed in indexing, regardless of feed and speed of cutter.

Brown & Sharpe Gear Cutting Machines are the result of sixty-two years' experience, not only as manufacturers of gear cutting machinery, but as extensive users and manufacturers of precision-cut gears.

Machine shown here is from our line of Spur Gear Cutting Machines. We also make machines for cutting both Spur and Bevel Gears. Both types have the indexing mechanism referred to above and countless other features that make them the ideal machines for the busy shop.

Information in Detail on Request.



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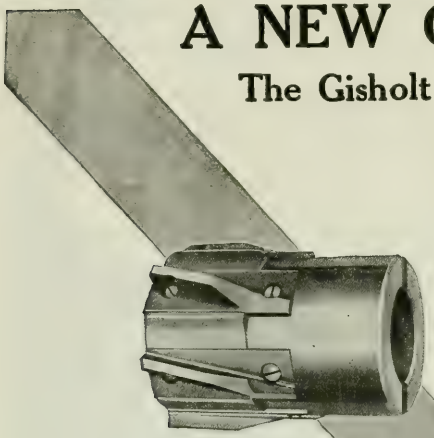

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Various Methods of Producing Threads

Threading Locomotive Set Screws—Steel Axles—Special Nuts—Tractor Axles—Worms—Lead Screws—Fine Pitch Threads and Internal Threads.

By J. H. MOORE

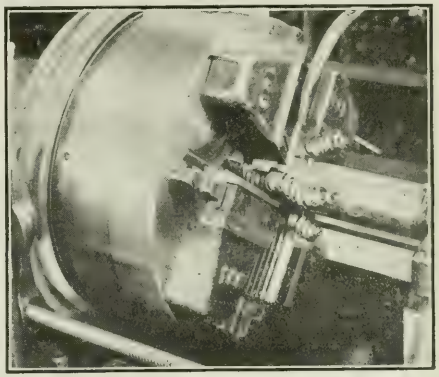


FIG. 1—SHOWING DIE-HEAD IN OPERATION.

ACCORDING to an old friend and authority, Daniel Webster, a thread is the projecting helical rib of a screw, the successive turns of which are often called teeth. This derivation is altogether too high-brow for our use, so let us simply state that a thread is something that mechanics are familiar with, have cut many a time, and hardly require a picture of to know what it looks like.

Why this peculiar introduction? you may ask. Merely to lead up to the next question, viz., How did you form the thread? Did you use a hand die? Did you use the lathe? Or did you form the thread by some other process?

The hand and lathe system requires no comment, for practically every mechanic has made threads by both these methods. But how about the manufacturing plant where duplicate threads are required in quantities? Either of the above methods is too slow, as too much care is necessary to produce approximately correct threads on the lathe. In such cases threading machines, irrespective of their type, are a necessity. Without them we could not manufacture many articles at present existing prices. Think of the bolts used on certain styles of machine tools, or even on pumps and engines. Can you see them in fancy, row upon row, circle above circle, each bolt a duplicate of the other, as far as practical need demands? Then again there is the finer screw, the thread of which must be absolutely correct. How could such threads be produced without some mechanical means to ensure a high degree of efficiency?

Believing that readers would be interested in examples of threading work performed, we have gathered together some interesting data on the subject, and will first of all start with the Landis method of producing threads. The photographs covering this method of threading were kindly supplied by the Landis Machine Co., Inc., Waynesboro, Pa., and bring out some very valuable points.

As the average mechanic knows by sight the appearance of these threading machines, we will confine ourselves to illustrations showing work performed, rather than photographs of the machines themselves. Briefly, such machines are used for obtaining production, and the standard style consists of a bed, a headstock, a die head and a carriage equipped with gripping vises. Depending on the size of work to be threaded, the machine is of proportionate strength, and in all cases they are provided with a die lubricating system. This brings us to the die itself, which is of course the main part of the machine. The die head used on the machines we are speaking of is of all steel construction, and the die proper consists of four chasers tangentially inclined to the work, to agree with the pitch of thread to be cut. Of course, adjusting mechanism is provided, this being of special design. Within the head of the die is an automatic opening and closing device which derives its action from the forward and backward travels of the carriage. The same device locks the head. Graduations are marked both right and left hand for all sizes within the range of the head. Briefly, this gives the general principles of the die head, but it by no means covers the details. Readers desiring further detail can get in touch with the company manufacturing these machines, but for the purpose of this article sufficient has been given.

These machines are, of course, made in different sizes and styles, ranging from the simple single head bolt threading type to the triple headed type. Depending upon the work to be accomplished, machines are used with or without a lead screw attachment. Then again for stay bolts, the machines are modified in design to suit this style of work, but in the main, the principle involved is the same.

Then again, there are the pipe and nipple threading machines. These vary in size and design, but all are based on the same principle, viz., that of a rotary die

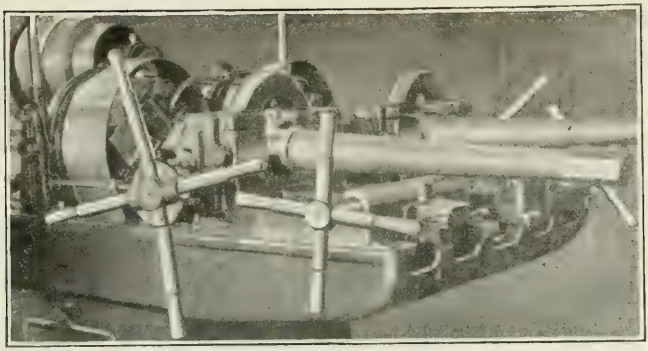


FIG. 4—THREADING CHROME NICKLE STEEL AXLES.

head. Boiling the whole matter down to a few words, the art of threading by this method consists of feeding the work into a suitable revolving die contained in a die head. Once the work has entered the die the true pitch of thread and proper diameter are assured, the die being set to proper size before commencing. Without going into further details, let us consider some examples of work performed.

Actual Threading Work

Fig. 1 gives a good view of a die head in operation. Of course, the main idea in showing this view is to illustrate how large a chip can actually be produced, even when cutting at a rate of 30 circumferential feet per minute, as the die was, when the photograph was taken. The stock was 30 point carbon steel, this being a rather nasty material to cut. It will be noted that the chips are similar to that of a lathe tool. This is due to the fact that the die itself operates on the same principle as a lathe tool.

Fig. 2 depicts a 4 inch single head motor driven machine threading locomotive set screws, the production by this method being 700 screws every ten-hour day.

Fig. 3 illustrates a 2-inch triple head machine. This is also used in a railroad shop, and the machine shown has been in use for twelve years. The triple head type of machine is much favored in railroad shops, due to the fact that each head may be set to suit a different size bolt, this of course reducing to a minimum the time of changing from one size to another.

The next photograph, Fig. 4, shows a 1½-inch double head machine threading axles. These axles are made from chrome nickel steel, heat treated, and the last operation is that of threading. It is, therefore, very important that the thread be correct, otherwise the axle would be scrap, and all previous work would be wasted. The reason we emphasize this point is to illustrate the fact that threads turned out by machine are perfect for all practical purposes. In fact, with proper care they cannot help but be correct, the dies guarantee that. This is a big feature, for once the dies are set, a cheaper class of labor can be used than otherwise could.

Although we have refrained from showing photographs of machines only, we make an exception in the case of Fig. 5. This depicts a 4-inch single head leadscrew threading machine with extension bed for cutting threads on stay tubes and stay rods for marine boilers. The pitch of the threaded stay tubes and stay rods must be continuous, and the machine was designed for that operation. The threads are first cut on one end of all stay tubes and stay rods. The threaded end is then gripped in the carriage at the end of the extension bed. The die head, the leadscrew, and the grips are then timed, and the other end of the rods and tubes threaded. In this way a continuity of thread is obtained.

We could go on indefinitely showing illustrations of applications of this threading method. We have photographs before us depicting the threading of work in automotive plants, the machines being equipped with special arbors for holding certain portions of the work. Other photographs depict machines for threading and cutting off pipe, machines for threading axle housings, leadscrews, stay bolts, etc. In fact, any work that can be accommodated within the limits of such machines can be threaded by this method, and where the quantity required warrants it, a machine specially suited for the work can be designed.

The Thread Milling Method

Although the previous method described is known in some small measure

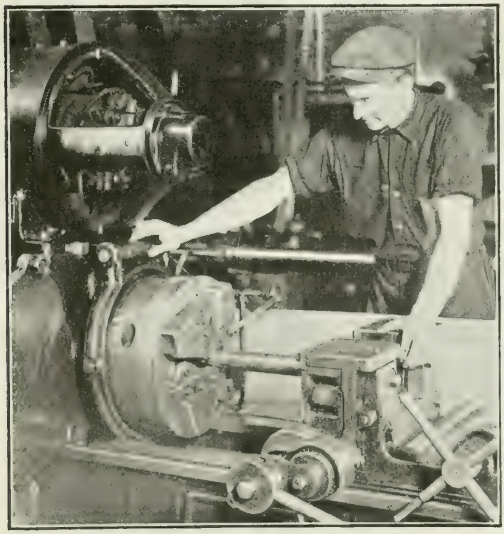


FIG. 2—THREADING LOCOMOTIVE SET SCREWS.

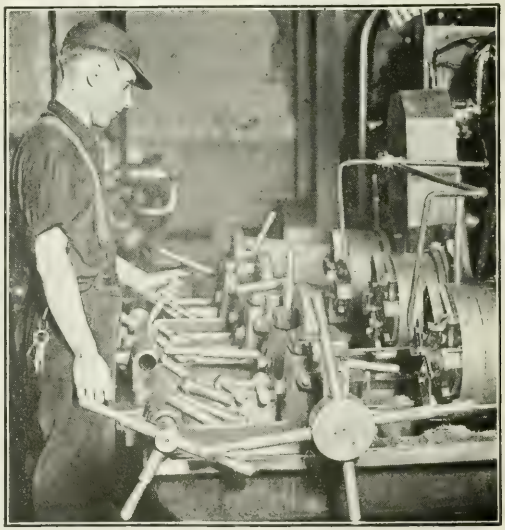


FIG. 3—THREADING MISCELLANEOUS STYLES OF BOLTS.

to the average mechanic, the system of thread milling remains somewhat of a mystery to him, not because it is difficult to understand, but because he does not take the trouble to investigate. Through the courtesy of the Smalley General Co., Inc., Bay City, Mich., and the Lees-Bradner Co., Cleveland, Ohio, we are able to discuss and show various examples of thread milling. First of all, what is thread milling?

Although not generally known, the art of thread milling is not a new process. As far back as the civil war, machines of this type were in use, but they are said to have been very crude and light. It is only within recent years that they have been developed into a commercial success. For the benefit of readers who are not familiar with the appearance of a thread miller let us refer to Fig. 6. This is what is known as a No. 23 S-G thread miller, and is primarily a singe purpose machine

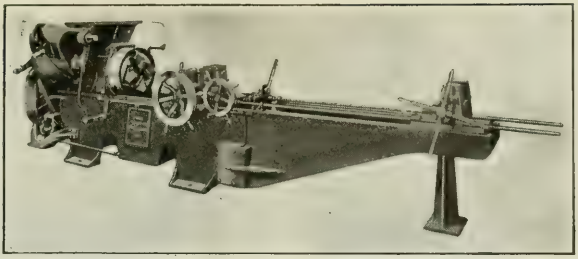


FIG. 5—4-INCH SINGLE HEAD LEAD SCREW THREADING MACHINE.

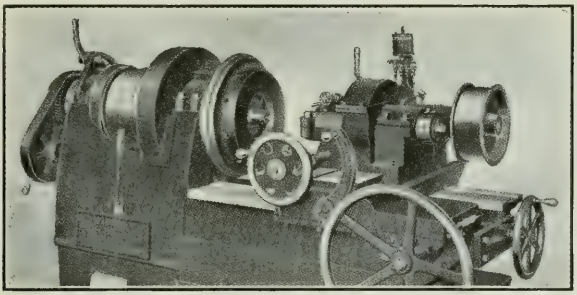


FIG. 6—A TYPICAL S-G THREAD MILLER.

designed for production work. This particular machine has three milling speeds, also three turning speeds which are proportional to the milling speeds. In some cases the three turning speeds are not embodied, but this is simply a question of design, rather than a change of principle. All S-G thread millers are based on the same principle, different types being suited for various classes of work.

Briefly, here is the action of these machines. Located on the ways is the bottom slide which, in turn, carries the top or cross slide. This cross slide is controlled in relation to the bottom slide by means of a micrometer screw by which the diameter of the thread is determined. The top slide carries the milling spindle. The milling hob is held on this spindle by means of a tapered arbor and draw in bolt.

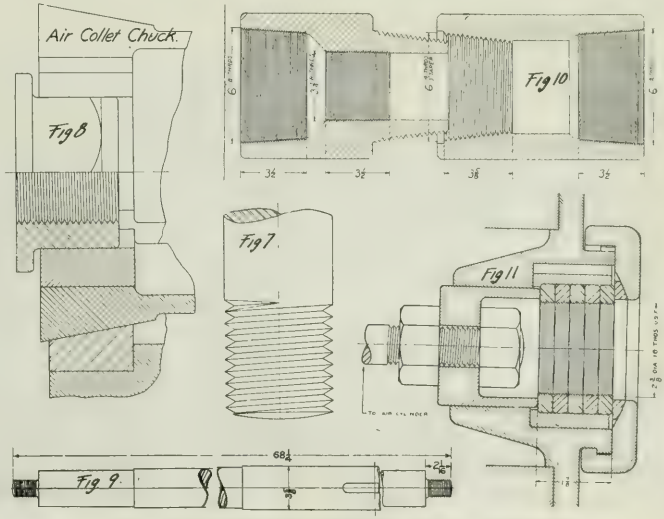
During the milling operation, while the work held in the chuck makes one revolution, the milling head is moved on the ways by the leadscrew a distance amounting to the pitch of the thread to be milled. Either internal or external, right or left hand, straight or tapered threads can be milled, although it is not possible to mill an absolutely square thread. A very slight angle is necessary for clearance, but acme threads are easily milled. When internal threads are to be milled the diameter of the hob must be slightly less than the diameter of the part to be milled in order to allow ingress and egress of the hob. This, of course, does not infer that a large hob must be used for large work. While usually a hob of large diameter would be used for milling an internal thread of large diameter, there is no particular relation between the diameter of the thread and the hob used.

In the single purpose S-G machine, milling of thread only is performed, but in the general purpose type, both turning and milling are accomplished. This, of course, enables the surfaces to be turned true with the thread, and in many cases saves an extra operation on some other machine. Of course, a lower speed is used for milling than that used when turning, but neither the tool nor the hob need to be removed during operations. In milling threads of 12 per inch or more, a direct driven spindle is used, but for coarser threads a back geared spindle is employed.

Milling Speeds

Milling speeds depend upon several factors, the material to be milled, the rigidity of machine, quality of hob, and the finish required. In sheet and cast iron, hob manufacturers recommend a cutting speed of 80 feet per minute and .004 inch feed per revolution with a hob 2⅛ inches diameter, which gives a milling feed of approximately 6 inches per minute. As a rule, however, a well constructed machine will run about a 9 inch feed instead of 6 inch.

It should be remembered that in thread milling the roughing and finishing cut are taken at the same operation. It therefore follows that the slower the



FIGS. 7 TO 11—SHOWING EXAMPLES OF WORK PERFORMED.

milling feed the better the finish. When a polished finish is required it is good policy to slow up the machine to 5 or 6 inches per minute, or else take a roughing cut first, following this with a light finishing cut. This procedure, however, is very seldom necessary. With milling speeds running from 9 inches to 12 inches per minute, the limits can be held to .001 inch or .002 inch, depending upon circumstances. In annealed high speed or hard alloyed steels the usual milling speed is from 2 to 3 inches per minute, with a cutting speed of 35 to 45 feet.

A great diversity of opinion exists as to the saving in time, increase in production, etc., between the various methods of threading. It is not for us to take sides. We merely present the methods used, the time taken to produce certain work, and any other data that will interest readers. From this point on, it is up to the reader himself to decide which method appeals to him. For example, the thread milling fraternity frankly state that in some cases they have shown increased production over other methods, while in others they have not. Of course, they finish these remarks by emphasizing that the thread obtained by their process is superior in quality. On the other hand, the champions of the Landis, and other systems, will tell you that they can give you better production, better threads, etc., than the thread milling, and so on. In other words, it is a case of experience; take your choice; but let it be thoroughly understood that we are simply presenting for readers' benefit the examples shown, not with any idea of comparison in mind. It might be well to add, before going on with examples of work performed, that thread millers, especially of the flange type, are often provided with special attachments. For example, facing attachments, etc. These, of course, are placed on the machine to eliminate any further operations. As far as possible the machine is designed and arranged to complete the work at the one set up.

Some Examples of Work

Let us now consider some examples of work performed on S-G machines, these being taken at random. Fig. 7 depicts a very common job, the material being No. 3 government steel 1½ inches diameter, 6 pitch thread, 1½ inches length of thread. On a ten-hour run an average rate of 1½ minutes for the operation was attained. This included facing and chamfering the end. Every thread was a forced fit, and had to pass government inspection. An air collet chuck was used.

The next example, Fig. 8, shows a special nut. The thread is 1⅝ inches diameter, 1½ inches length, and .12 inch pitch U.S. standard. The milling feed used was 9.6 inches per minute, and the material was .20 carbon steel. An air operated collet chuck was used, and this work was accomplished in a No. 2 machine. Here is a brief statement of the time for completing this nut. Chucking 5 seconds, boring and facing 1 minute 45 seconds, adjusting head for milling 10 seconds, milling 32 seconds, removing from chuck 5 seconds, this bringing the total up to 2 minutes 37 seconds.

Fig. 9 illustrates a tractor axle threaded by this method. The thread is 1½ inches diameter, 2 1-16 inches long on each end, 6 pitch U.S. standard. The material is machinery steel, and the milling feed used is 4.35 inches per minute.

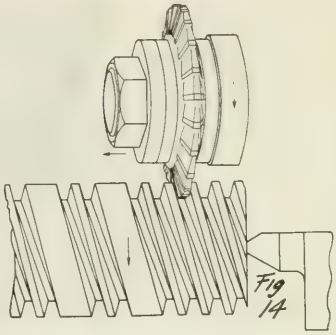


FIG. 14 CUTTING A TRIPLE THREAD LEAD SCREW.

Each thread is milled in 65 seconds, with a floor to floor time of 5 minutes 37 seconds, the balance of time being of course used up in handling. These parts were chucked through the rear end of spindle. It was a rather awkward operation as the pieces were larger in the center, and the type of chuck used would not let them through. A collet chuck with false collets would have permitted faster chucking.

The work shown at Fig. 10 is very interesting. The piece milled is a pin and box, and the thread is 3¾ inches diameter, 4 inches length, 6 pitch U.S. standard, with 3 inches taper per foot. The milling speed used is 4½ inches per minute, and the material .20 carbon steel. A hand operated screw chuck is used, and floor to floor time is six minutes. The former time of this piece, as threaded in the lathe, was 1½ hours.

Fig. 11 illustrates a good example of multiple chucking. To insure the best results from this style of chucking the parts should run close to size. The work shown was accomplished on a No. 23 machine, and the 6 inch hollow spindle on this size machine afforded a good opportunity of doing this class of work in a face plate chuck, thereby holding the parts to be milled within close relation to the main bearing.

The chuck used was air operated, and here is the time occupied: Chucking in and out 15 seconds, setting carriage and hob 5 seconds, milling 50 seconds. This makes a total of 1 minute 10 seconds or a time of 14 seconds each, there being 5 nuts chucked at one time. The thread was 2⅜ inches diameter, 1⅞ inches long, and 16 pitch. The material was machine steel, and a milling feed of 9 inches per minute was used.

Let us next pass on to another type of thread miller, namely the Lees-Bradner. From now on, the information given will be from their point of view.

Thread Milling Work Classified

The views to follow are intended to clarify the subject of thread milling by separating the work into classes, explain-

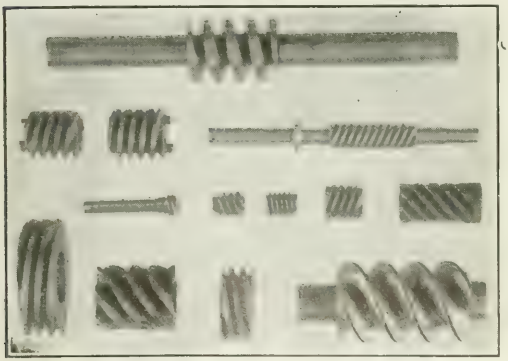


FIG. 12- VARIETY OF WORMS THAT HAVE BEEN PRODUCED BY THREAD MILLING.

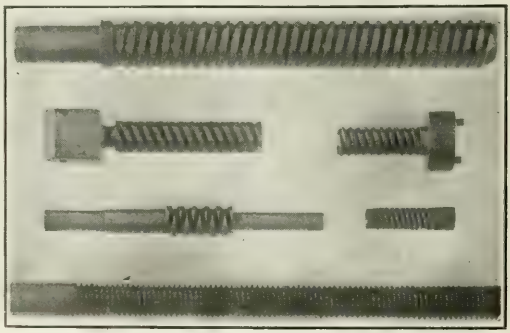


FIG. 13 COLLECTION OF LEAD SCREWS AND OTHER THREADS CUT BY THREAD-MILLING PROCESS.

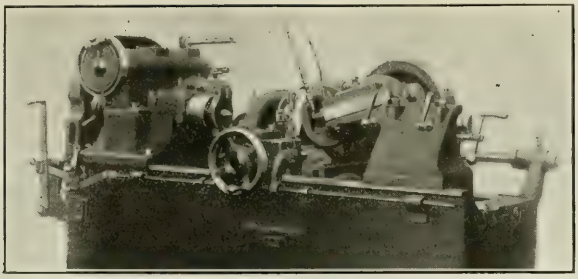


FIG. 15—A STANDARD L-B THREAD MILLER.

ing the method employed for each class of work.

Fig. 12 shows a variety of worms both single and multiple threaded which have been advantageously produced by the thread milling process. It will readily be seen that a worm with a large number of threads has a greater thread angle and approaches a helical gear in appearance. There may be times when the question arises as to whether a particular job should be called a worm or a helical gear. The differences are that in a worm we speak of the number of threads and of the "thread angle," meaning the angle between a thread and a line at right angles to the axis; whereas in helical gears we speak of the number of teeth and of the "helix angle," meaning the angle between a tooth and the axis of the gear.

A five threaded worm with 20 degrees thread angle might be called a five tooth helical gear with 70 degrees helix angle, except for the difference between the form of thread on a worm and the form of tooth on a helical gear. The threads on worms are usually cut with straight sided cutters and the pressure angles specified in a plane along the axis of the worm, whereas the teeth of helical gears are generated with hobs and their pressure angles are specified in a plane normal (at right angles) to the tooth. In addition to these differences it is customary to specify a helical gear by the normal diametrical pitch, whereas worms are specified by the circular pitch of the worm gears with which they are to mesh; the circular pitch of the worm gears being the same as the axial pitch of the worms. All of the jobs shown in Fig. 12 are specified as worms and use single cutters with straight sides at the required angles. Fig. 13 shows a collection of lead screws and other threads cut by the same process. We find this process illustrated in Fig. 14, which represents a triple thread worm or lead screw. The directions of rotation and travel are indicated by three arrows.

The problem of gearing up a thread miller to mill a thread of a given lead is practically the same as gearing up a lathe to cut the same lead. The carriage carrying the cutter moves along the bed of the machine parallel to the axis of the work a distance equal to the lead of the thread for each rotation of the work. The line drawing in Fig. 14 shows two threads finished and the third thread in process of cutting. Three passes of the cutter are required to finish the job except in the event of two cuts being taken through each thread on a worm of heavy pitch. If it is desired to take two cuts on a lead screw, the finishing is done at a separate setting to allow some time for seasoning between the two cuts.

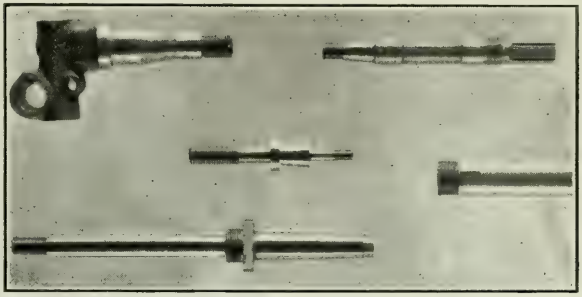


FIG. 17—A FEW EXAMPLES OF MALE THREADS THAT ARE MILLED ON PARTS HELD BETWEEN CENTRES.

Aside from gearing up to travel the cutter one lead for each rotation of the work, it is only necessary to swivel the cutter spindle to the thread angle and arrange the work to rotate at a suitable peripheral speed for the milling feed. The question of cutter speed is merely one of material, though it should be borne in mind that a high cutter speed produces a smoother thread than a low cutter speed with any given speed of work rotation. The ratio between cutter rotation and work rotation is not fixed as it is in hobbing a helical gear.

The standard L-B thread miller shown in Fig. 15 is used for these classes of work as well as for some others which we will show later. It will be noted that the cutter spindle is arranged to swivel to the required thread angles and that the depth of the cut is controlled by a hand wheel at the front of the carriage. This hand wheel is provided with micrometer graduations and an automatic stop which insures accurate duplication of work. When multiple threads are cut with a single cutter the indexing of the work is accomplished by the indexing mechanism above the head stock. The

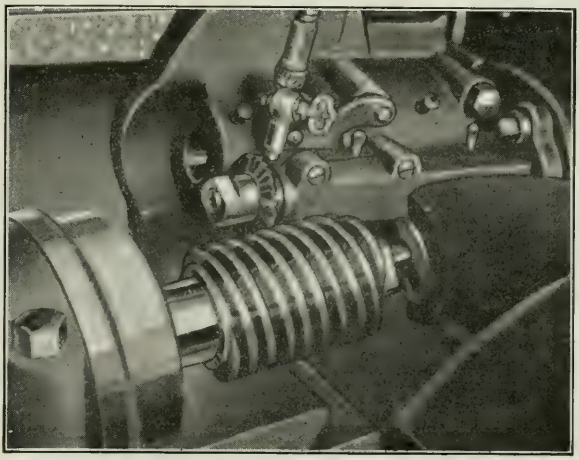


FIG. 16—THIS TYPE MACHINE IS DESIGNED PRIMARILY FOR HOBBING SPUR GEARS, SPLINE SHAFTS, ETC.

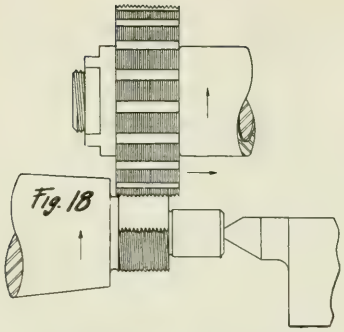


FIG. 18—METHOD OF CUTTING SUCH THREADS AS SHOWN AT FIG. 17.

machine handles work between centers or in a collet chuck.

Another machine which is sometimes used for thread milling worms is shown in Fig. 16. This is an L-B gear generator, designed primarily for hobbing spur gears, spline shafts, helical gears, worm wheels, etc. A high speed head which is special equipment provides a cutter spindle suitable for thread milling and the wide range of gear ratios available through the change gear train makes it a practical machine for the milling of worms. In many shops it is desired to produce a worm and a worm gear but the quantity does not warrant the installation of both a hobbing machine and a thread miller. In such cases the thread milling feature of the gear generator is found useful.

Ring Type Thread Milling on Shafts

Fine pitch threads, that is, threads with a pitch of less than ¼ inch (four or more threads per inch) are milled with ring type cutters. Fig. 17 depicts a few male threads of this description on parts that are held between centers, while Fig. 18 illustrates the method of milling these threads.

It will be noted that the cutter is a gang of cutters made in one piece. It is termed a "ring type" cutter because the teeth are arranged in rings, not in the form of a thread. These ring type cutters are frequently called hobs, but since they have no lead they are not strictly hobs.

As shown in Fig. 18, the entire length of thread is milled at one rotation of the work. In ring type thread milling the axis of the cutter is set parallel with the axis of the work. The method of operation is the same as milling with a single cutter, but it is only necessary to rotate the work a trifle more than one turn instead of one turn for each thread. The cutter head is geared to travel one lead of the thread for one rotation of the work. Starting with the cutter in motion the operator engages the feed which starts the work to rotating and the cutter head to traveling; he next brings the cutter in to full depth; after the work has made one complete rotation he backs the cutter out and removes the finished work from the machine.

A comparison of Fig. 18 and Fig. 19 will make this operation clear. The operation shown in Fig. 19 is milling the smaller one of the two threads on an automobile transmission spline shaft. The larger thread is milled in the same manner on the same machine at a different setting. Should these two threads be of the same pitch the only adjustment necessary in going from one job to the other is to change the setting of the depth stop on the micrometer hand wheel. In going to a thread of much larger diameter a change would also be made in the speed of work rotation, for the peripheral speed of the work is the milling feed. In changing from one pitch to another it is necessary to change the cutter and to change the gears driving the lead screw which travels the cutter head along the bed of the machine.

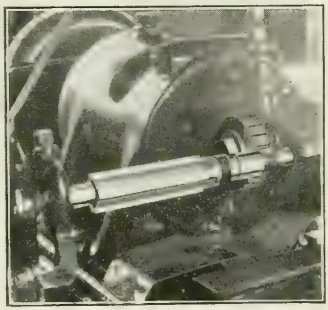


FIG. 19—MILLING A THREAD ON AUTOMOBILE TRANSMISSION SPLINE SHAFT.

The cutters employed are known as "ring type" cutters because their teeth are arranged in angular form, that is, in straight rings instead of in the form of a thread. The cutter shown in Fig. 8 is made in staggered form by the omission of each alternate tooth in each ring, but the common practice at present is to leave all of the teeth in. The distance between teeth measured parallel with the axis of the cutter is the same as the axial pitch of the thread to be cut. No correction is necessary for the difference between axial and normal pitch, for the axis of the cutter is set parallel with the axis of the work. There is a very slight difference between the pressure angle of the teeth in the cutter and the pressure angle of the resulting thread, but since this method is used on threads of relatively fine pitch and consequently of small thread angle, this difference is negligible.

The threads produced in this manner are extremely accurate and uniform results are easily obtained on quantity production. Thread millers of this type have been used in the manufacture of plug and ring thread gauges. These gauges were found to fit so closely that air holes had to be drilled to allow the mating gauges to be screwed together.

Milling Multiple Threads With Ring Type Cutters

Fig. 20 shows an interesting application of ring type cutters to the milling of threads longer than the cutters. The cast iron drum shown is 9 inches in diameter and 40 inches long, threaded its entire length ⅛ inch pitch 1 inch lead. A ring type cutter with square teeth measuring ⅛ inch from center to center is employed on this job and the machine is geared up so that the cutter travels 1 inch for each rotation of the work instead of ⅛ inch which would be the case in cutting a single thread. At each revolution of the work the cutter travels 1 inch along the axis of the work so that the complete thread is finished in 41 revolutions of the drum. This method of threading may be compared with the cutting of a double thread worm or screw by the method shown in Fig. 3 but using a double cutter instead of a single cutter. If, for instance, we use a triple cutter on the job shown in Fig. 14 it would be possible to finish the complete thread at one cut, rotating the work as many times as the lead of the thread goes into the length of the thread. This, however, would necessitate the making of a specially formed cutter, which would really be three cutters in one. The central cutter would be the same as the one used in milling one thread at a time and the cutter would be so located on the cutter spindle that the center of the cutter comes at the point about which the cutter

FIG. 20—THIS DRUM IS 9" DIAMETER, 40" LONG, AND THE THREAD IS ⅛" PITCH, 1" LEAD.

spindle swivels. The two outer cutters of this triple cutter would necessarily be of slightly greater outside diameter and the tooth forms would be such that all three threads would be cut the same shape. Single cutters are employed in milling multiple threads where the greatest possible accuracy is required and multiple cutters are used where production is of first importance.

External Ring Type Jobs on Work Held in Chucks

All the parts shown in Fig. 21 are threaded externally with ring type cutters. These parts must be held in chucks or special fixtures of some sort which may be either hand or air operated. In some cases, as for instance the externally threaded ring nut shown in the lower right-hand corner, it is possible to thread more than one part at a time. This particular part is 6⅜ inches outside diameter and has a face of ¾ inch. Three of these parts are held in a special air operated chuck and the three parts are threaded at one rotation of the work spindle. This particular job is running on a standard L-B thread miller as shown in Figs. 15 and 19. The floor to floor time on the three parts is 4½ minutes, giving a production of 40 pieces per hour.

Any of the parts shown in Fig. 21 might be handled on either standard L-B thread millers or the collet type L-B miller. The choice between these two types would depend largely upon what other thread milling work it might be desired to handle on the same machine. The standard machine, for instance, handles work held between centers and is arranged to swivel the cutter spindle for use in milling worms and lead screws as shown in Figs. 12 and 13, while the collet type machine is, on the other hand, suited for milling internal threads on work held in chucks, but is not designed to handle work between centers or to tilt the cutter spindle for milling worms and lead screws.

Internal Ring Type Jobs

Fig. 22 shows a variety of jobs that are best handled by the ring type method on the L-B collet type miller. These machines are built in a variety of sizes with various diameters of collet chucks and of holes through the work spindle. On this type of machine the cutter spindle is fixed parallel with the work spindle and is adjustable only as to center distance between the two spindles and longitudinal position of the cutter.

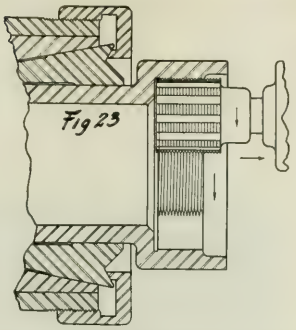


FIG. 23—METHOD OF MILLING AN INTERNAL THREAD.

The operation of milling an internal thread as shown in Fig. 23 is practically the same as the milling of an external thread as shown in Fig. 18. It will be noted that in milling internal threads it is necessary to back the cutter out of the thread and then withdraw it entirely from the work in order to remove the finished piece from the machine and place another piece in the chuck. This introduces the question of taking up back lash in the lead screw when the cutter is brought back to position to start a new thread. This is taken care of in an interesting manner. The lead screw which travels the cutter during the operation is carried on the carriage, while the movement of the carriage on the bed is controlled by the turn-stile at the front of the machine. It is only necessary that the cutter moves longitudinally a distance equal to the lead of the thread for each piece threaded. The cutter is then withdrawn from the thread by means of the micrometer hand wheel and the carriage is released so that it is free to travel along the bed of machine. The operator then withdraws the cutter entirely from the work by means of the turn-stile without disturbing the lead screw. When the new piece has been placed in the chuck the cutter is brought back to position, the carriage clamped again to the bed of the machine and the feed started at the point where it left off; thus there is no back lash in the lead screw or its driving mechanism to be taken up. The lead screw operates constantly in one direction and it is only after the entire length of the lead screw has been used up that it is reversed and the back lash taken out before the next piece is started.

Ring type cutters are designated as right or left hand according to their direction of rotation. This has nothing to do with the cutting of right or left hand threads except as it may be necessary to rotate the cutter in a certain direction in order to have the cutter feed away from a shoulder instead of toward it. In Fig. 23, for instance, the cutter is designated as "left hand" because it rotates to the left as viewed from the driven end. This designation is the same as employed for drills or reamers. This left hand cutter is, however, being used to mill a right hand thread. If a right hand cutter were used to mill a right hand internal thread it would be necessary to travel the cutter toward the work spindle instead of away from it. This would necessitate stopping the machine at the instant the thread was completed to avoid collision between the cutter and the shoulder at the bottom of the thread. With the cutter travelling away from the work as shown there is no possibility of accident if the feed stop is not set exactly, or the operator neglects his machine. No damage is done to the threads if the machine is allowed to run after the thread is finished.

SEEK PROTECTION

Washington. — Legislation is being sought by American makers of Diesel engines to protect them against importations of this type of engine produced by foreign manufacturers at less than they can be made in the United States. The claim is made that unless sufficient protection is given either to greatly restrict or to entirely prevent importations, enough Diesel engines will be brought into this country in the next six months to equip all American ships that may be built in the next two years.

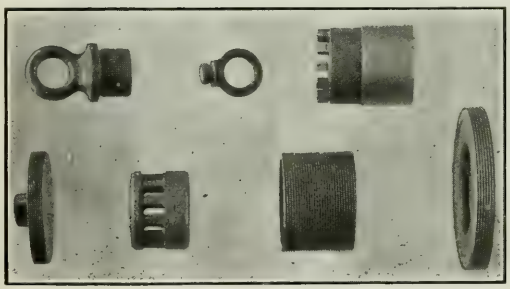


FIG. 21—EXAMPLES OF EXTERNALLY THREADED PARTS CUT WITH RING TYPE CUTTERS.

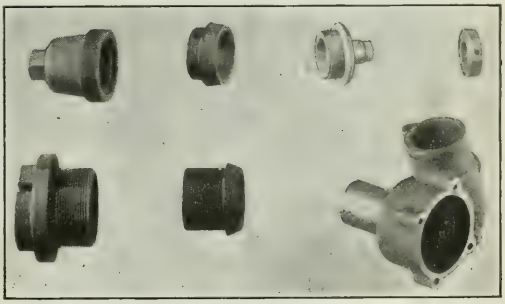


FIG. 22—SOME EXAMPLES OF INTERNAL RING TYPE JOBS.

Machining Cast Iron Pump Body in 22 Minutes

Pump is of Semi-rotary Type—Extreme Accuracy Necessary—Special Chuck Jaws Used—Taper Bore is Produced by Profile Method—Machining a Distributor Case for Gnome Aero Engine

By A. H. LLOYD, B.Sc., M.B.E.

CONTINUING our talk on Herbert turret lathe practice, from recent articles appearing in February 17th and March 24th issues of Canadian Machinery, we shall consider the tools used in machining a cast iron pump body. Fig. 1 depicts these tools. This pump has to be machined to a very fine degree of accuracy, otherwise it would not perform its work efficiently.

The large bore is tapered approximately 1½ deg. a side, and must be accurate in diameter and taper. The bottom face must be smooth and flat, and an exact depth from the front flange. There is also a small blind hole which serves as an end bearing for the rotor spindle. The sequence of operations is shown on the lay-out drawing at Fig. 2. The chucking is effected by means of a set of special jaws gripping through the solid metal at the bottom of the hole, and so minimising the risk of distortion. No. 1 is a centering tool for starting the drill. No. 2 is a twist drill. No. 3 combines two tools for rough facing the flange and the bottom of the large bore simultaneously. No. 4 is a standard turning head taken from a combination tool, which provides a very stiff and effective tool for rough boring the large hole parallel. No. 5 is a four-flute reamer which finish bores the small hole and squares the bottom. No. 6 is a pair of facing tools similar to 3 for finish facing—in addition to the production advantage of machining the two faces simultaneously, you have the advantage that the exact depth of the hole is assured after the cutters have been correctly set. No. 7 shows the method of producing the taper bore, which is done by a profiling method. The boring tool is mounted on a slide which can move transversely to the axis of the lathe. This is brought into position at the bottom of the large bore, and then fed into the work by a bracket on the back of the cross slide, which carries the taper former. The tool being fed into depth, the turret traverse is engaged in the reverse direction, and the profiling slide feeds away from the chuck. A spring in the slide and the pressure of the cut keep the roller on the slide against the former, the cutting tool therefore produces a tapered bore, the taper of which is governed by the inclination of the former. The former is arranged to swivel through a small amount to facilitate setting it up accurately. The machining time for this pump body is 22 minutes.

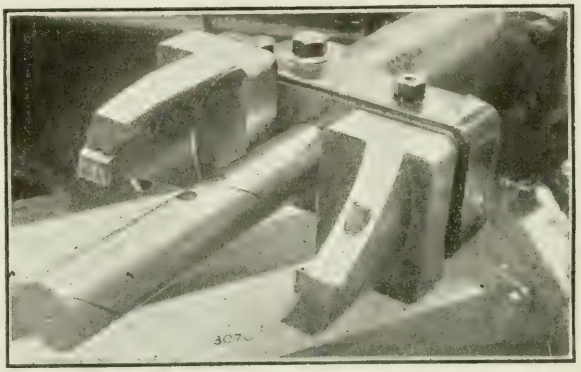


FIG. 5—CLOSE UP VIEW OF TREPANNING TOOL.

It has been said with regard to turret lathe work that the more difficult and involved it is, the greater is the economy which can be effected by the adoption of highly specialized tool lay-outs. The truth of this statement is very well demonstrated in the machining of the distributor case for the Gnome Monosoupape Aero-Engine, which is probably one of the most difficult, yet successful jobs which has been handled on a turret lathe. An idea of the shape of the piece will be seen at Fig. 3, which shows the set up for the first operation.

The finished diameter of the flange is about 14½ inches, and the overall length about 4½ inches. There is a counterbore 7 inches diameter, and an annular recess 10 inch bore, 1 7-16 inches wide, 4 inches deep, which necessitates a trepanning operation. In work of this

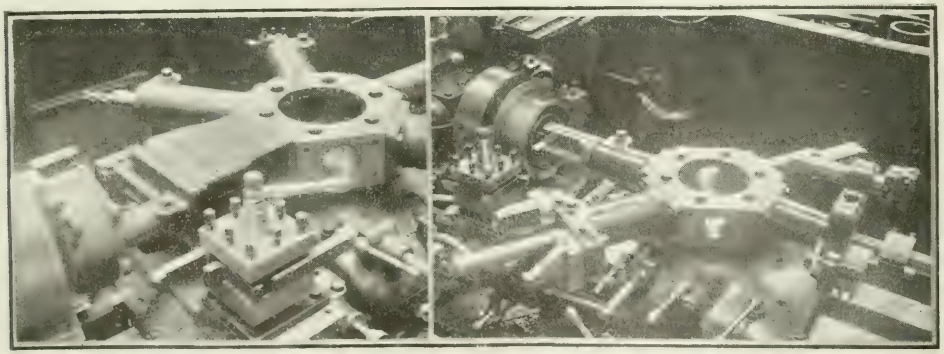


FIG. 1—LEFT HAND VIEW SHOWING SET-UP FOR MACHINING SEMI-ROTARY PUMP BODIES.
FIG. 3—RIGHT HAND VIEW. SET-UP FOR FIRST OPERATION ON DISTRIBUTION CASES.

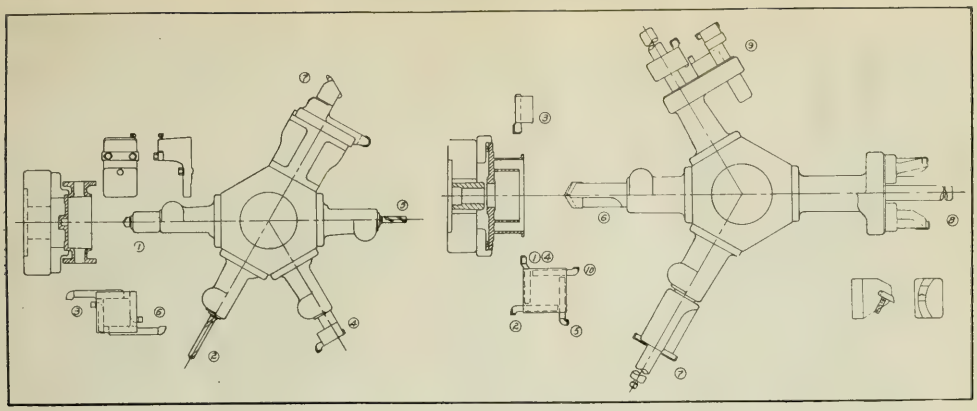


FIG. 2—LEFT HAND VIEW. SHOWING LAYOUT FOR SEMI-ROTARY PUMP BODIES.
FIG. 4—RIGHT HAND VIEW. LAYOUT DRAWING OF DISTRIBUTION CASES.

kind where the work is fragile and there is a large amount of metal to be removed, it is necessary, in order to avoid distortion in the finished piece, to rough out the work all over and then re-machine to finish sizes. In the work we have under consideration this method is used, and the lathe operations are four in number.

Fig. 4 illustrates the lay-out for the first operation, in which the forging is gripped on the large flange. The dotted line round the work shows the shape of the rough material, which is of high tensile steel, and the amount of metal to be removed. Tool No. 1 takes a rough cut along the small diameter of the forging as far as the flange. Tool No. 2 rough faces the large flange, the end, and also rough turns the bead. Tool No. 3 rough forms a gap behind the small flange to allow tool No. 4 to be used for rough turning the small diameter. Tool No. 5 then roughly forms the under cut below the bead. No. 6 is a straight flute twist drill with inserted spiral cutter, which drills right through the flange. No. 7 is a counterbore for opening up and facing the bottom of the large bore; a steady bush in the chuck is provided to pilot this tool.

No. 8 is without doubt the most interesting tool in the lay-out and is provided for trepanning the annular recess. We will consider this tool more closely presently. No. 9 is a combination tool carrying a pilot bar on which is mounted a collar with a facing cutter, taking the second cut in the large bore, and recessing the bottom of the hole. The second cutter faces the edge roughly to length, and a turning cutter takes a second cut over the small flange which is used as a location at the next operation.

The Trepanning Tool

Fig. 5 shows a close up view of the trepanning tool. The cutters are inserted in two steel holders, bolted to a special flanged holder. The whole arrangement is piloted in the chuck by a substantial bar, and the fact that the cutters are balanced, liberally top raked, and substantially supported, enables a feed as coarse as 88 cuts per inch to be used. The trepanning tool, together with the counterbore used at the first operation, between them remove over 100 lbs. of metal. In the second operation, shown at Fig. 6, the work is clamped back on to a face-plate fixture, as shown. The tooling for this operation is of a comparatively simple nature. Tool No. 1 in the square turret is used to rough turn and face the flange and spigot, and also to rough face the boss. No. 2 is a standard combination tool which carries a boring bar for opening out the ball race and taking a second cut in the small bore. Attached to the combination tool is a special steel holder with a taper form tool for forming the bevelled side. In this case, the scale has been previously removed by a straight cut, and the surface can therefore be finished with a forming tool.

In the third operation, shown at Fig. 7 the work is chucked in exactly the same way as for the second operation, and the surfaces corresponding to operation 2 are finished to size. No. 1 is a combination tool carrying a boring bar for taking a second cut in the ball race, and a form tool for finish facing the bevelled side. No. 2 is another combination tool with a boring bar for finish boring the ball race and facing to length. One of the turning heads carries a cutter for

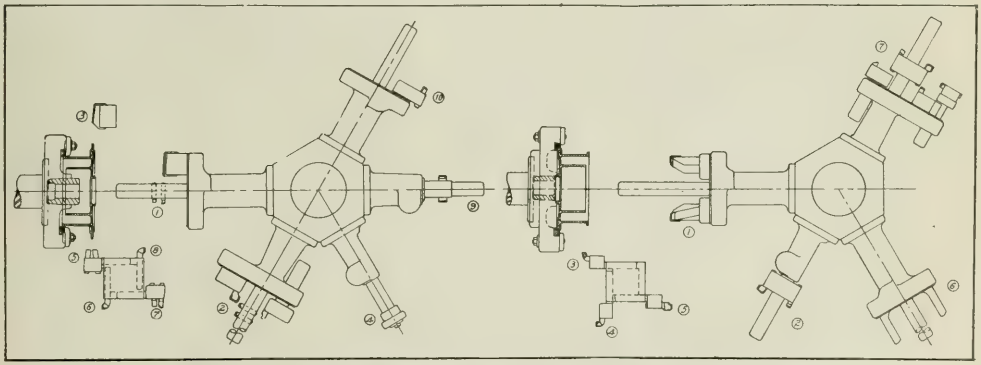


FIG. 7—LEFT HAND VIEW. SHOWING THIRD OPERATION ON DISTRIBUTION CASE.
FIG. 8—RIGHT HAND VIEW. FOURTH OPERATION ON THE SAME PIECE.

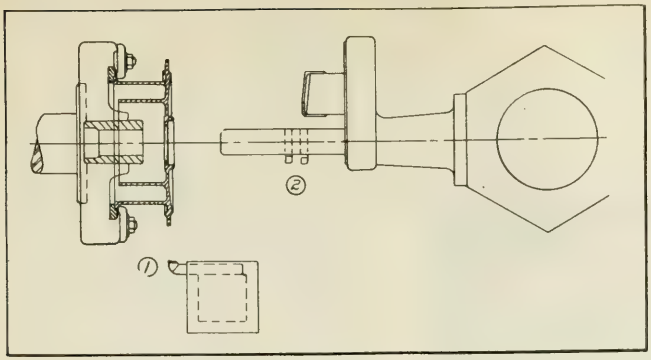


FIG. 6—SECOND OPERATION ON THE DISTRIBUTION CASE.

forming the radius on the boss, and another for finish facing the flat portion on the flange. The taper portion is formed by tool No. 3 mounted on the back cross slide tool holder. No. 4 is a revolving steady peg which is used during the cross slide operations. No. 5 is a duplex tool holder carrying two facing cutters which deal with the sides of the flange. It is necessary to finish both sides of the flange at this operation for the purpose of clamping at the next operation.

Tool No. 6 finish turns and faces the spigot. No. 7 finish faces both sides of the flange, also forms the outside of the beading. No. 8 forms the taper on the outside of the flange. No. 9 sizes the ball race diameter with a floating cutter bar which has been previously described. No. 10 sizes the spigot with a tool in the standard combination tool.

At this stage it will not be out of place to point out that it is advisable in designing faceplate fixtures to be sure that they are sufficiently substantial, so that when the work is clamped up, the fixture itself does not distort under the stresses introduced by clamping. In order to avoid excessive weight, the casting may be cored out from the back, but it should be strongly reinforced by radial ribs.

At the fourth operation a faceplate method of chucking is again used, and the surfaces corresponding to the first operation are re-machined to finished sizes. The tool lay-out is shown at Fig. 8. This view will give some idea of the proportions of the faceplate fixture. This locates from the spigot machined at the third operation. Tool No. 1 is the trepanning tool which is used at the first operation, but with another pair of cutters for finishing both sides of the annular recess. One cutter is set to do the turning and the other does the boring. Each cutter takes care of part of the facing of the bottom of the recess. No. 2 finishes the large bore and faces the edge to length. No. 3 in the square turret finish turns and faces the back of the small flange, and turns the portion in between the two flanges. No. 4 takes sizing cuts on these surfaces. No. 5 finish forms the taper below the bead and a portion of the radius on the bead. No. 6 takes sizing cuts on the inside and the outside of the annular recess with single point bars. No. 7 is a combination tool carrying a boring head with cutters for sizing the large bore and forming the radius on the boss at the bottom of the hole, sizing the small flange, finish facing the edge to length, and chamfering the large bore.

The total machining time for the four operations on this piece is 7 hours, which, having regard to the large amount of metal to be removed, the accuracy required, and the fragile nature of the work, was considered good production when compared with previous methods.

Plant Sold.—The blast furnace owned by the Atikokan Iron Co. and others at Port Arthur has been sold. The city of Port Arthur, which is a shareholder in the furnace and property, ratified a resolution to dispose of the plant for $1,000,000. Two hundred thousand dollars is to be paid by the purchasers within four years and the remaining $800,000 at the expiration of the four-year term. Two months ago the Atikokan Iron Co.'s mine, said to be one of the biggest producers in the district, was disposed of to Duluth interests. It is understood that the furnace at Port Arthur will be operated in connection with the mine.

DATA PERTAINING TO SPHERE

The surface area of a sphere is equal to 3.1416 times the square of the diameter. Four times the area of one of its great circles. It is also equal to the convex area of its circumscribing cylinder. Surfaces of spheres vary as the square of their diameters.

The volume of a sphere equals .5236 times the cube of the diameter. Also one-sixth of the surface area multiplied by the diameter. Volumes of spheres vary as the cubes of their diameters.

To find the volume of the segment of a sphere.

From three times the diameter of the sphere subtract twice the height of the segment, multiply the difference by .5236 times the square of the height. Or, add the square of the height to three times the square of the radius of the base, and multiply the sum by .5236 times the height.

Example: Diameter of sphere equals 20 inches, submerged to a depth of 7 inches.

Surface area 3.1416 D^2=3.1416 x 20 x 20=1256.6 sq. in.

Volume in cu. ft.

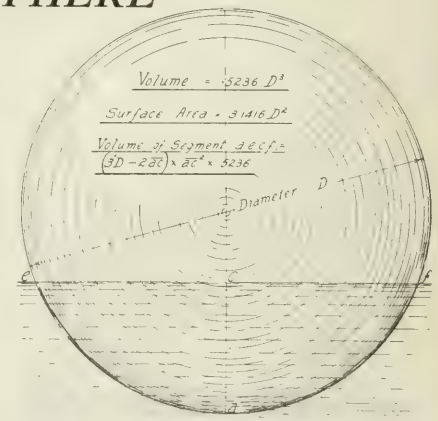
$$.5236 \text{ x } 20 \text{ x } 20 \text{ x } 20$$
$$=.5236\ D^3=\frac{.5236 \text{ x } 20 \text{ x } 20 \text{ x } 20}{1728}=2.424 \text{ cu. ft.}$$

Volume of segment when (a c) equals 7 inches.

(3 D—2 ac) x $(ac)^2$ x .5236=46 x 7 x 7 x .5236=1180.2 cu. in.

Weight of water displaced=.03617 x 1180.2=426.9 lbs.

Weight of one cubic inch of water equals .03617 lbs.



Canadian Machinery

Improve Your Powers of Perception—Try This Contest

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.

The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Only one reader submitted a correct list this week, John McNaughton, Westville, N.S., being the scale winner. Questions 2 and 12 were the ones that caused the trouble. Look at these advertisements once more and you'll see why Mr. McNaughton was correct.

CONTEST FOR APRIL 28TH ISSUE

Contestants are required to write us, stating to which advertisements we refer in this number.

1—Something that is never behind.

2—How to secure accuracy and a high production rate.

3—Something that is full of practical ideas.

4—A case where you get full value for your money.

5—An example of work worth while.

6—A case where writing, phoning, or wiring, obtains the same result.

7—Something that has proved entirely satisfactory.

8—A product that is made in one piece.

9—Something that you can rely upon on every occasion.

10—Something that is not new, yet is guaranteed.

11—A product said to fit any make of machine.

12—Something that is easily connected.

These are Correct Answers for List from April 7th Issue:

1—The Cleveland Twist Drill Co.

2—J. G. Blount Co.

3—H. H. Robertson Co., Ltd.

4—Puro Sanitary Drinking Fountain Co.

5—The Aurora Tool Works

6—D. K. McLaren

7—The Hendey Machine Co.

8—Ford-Smith Machine Co., Ltd.

9—Madison Mfg. Co.

10—National Electro Products.

11—Geometric Tool Co.

12—J. H. Williams & Co.

Closing Date for This Contest is May 19th

Milling an Automobile Clutch Shifter Yoke

ROBERT MAWSON

DURING the past few years more attention has been given and experiments made in regard to milling operations than ever before. Present-day competition, which calls for the reduction of manufacturing costs in every line, has made this necessary. The earlier types of milling fixtures were designed to only hold one or two elements, and when these were completed it was then necessary for the operator to stop the machine to unload and reload the fixture. It is easy to see that this meant a loss of valuable time, for when the machine is stopped no parts are being produced. The ideal condition, therefore, would be to arrange the machine with a fixture so that it could be run continuously. Much thought has been given to this subject, and in the present article are shown various fixtures designed for continuous milling.

The illustration, Fig. 1, shows a fixture for milling motor frames used on automobile starters, these pieces being made of cast iron. The operation shown is that of milling the base, and the fixture is designed to hold twelve pieces. The castings are first placed on a stud, which passes through a cored hole at right angles to the surface to be machined. An open washer is then slid over the outer surface of the casting and back of the serrated nut, this being next tightened up by hand. This forces the piece back against a stop pin at the rear of the tool. Between each pair of motor frames it will be observed there is a fixed steel wedge, and on the other side is a sliding wedge. The lower end of this element is made with a notched ledge or shelf, into which is pushed the hook bolt as shown. On the thread of the bolt is placed a shouldered pin nut, and after the bolt and nut have been swung into the position, the operator merely tightens the nut, when the sliding wedge is drawn down.

FIG. 4—DETAIL OF THE CLUTCH SHIFTER YOKE.

The action exerted by this wedge is to force over the casting against the fixed wedge. It can easily be seen that the two mediums of holding, the hand nut in front, and the wedges on top, enable the operator to secure the casting very rigidly against the strains exerted by the cutter. The operator stands in front of the machine and as the finished parts come round he removes them and replaces with rough castings, thus making the milling continuous.

The interesting operation of milling a large casting by the continuous method is shown in Fig. 2. This is an automobile differential gear housing and weighs 40 pounds. The fixture is designed to hold two castings and these are placed in such a position that the operator can replace a finished part with a rough casting without stopping the machine. The casting is located by means of a large plug, which fits into the cored hole through which the drive shaft enters. This plug is fastened to the wall of the fixture, thus affording a fixed locating medium. Two other stops are provided, one at each outer end of the housing. The reader may see one of these by referring to the illustration at the left immediately behind the housing not being machined. The milling operation is performed with the large inserted tooth cutter shown. With this tool set-up 22 castings have been machined per hour. The former method could only realize a production of nine per hour.

The illustration at Fig 3 shows a two spindle vertical milling machine and fixture used for machining automobile connecting rods, the fixture being designed to hold ten forgings. The tool is made with fixed steel tapered block, against which the small end of the rod is placed. The large end of the forging is located in a fixed steel vee block on one side, and half a fixed steel vee block at the other side, at the large end of the rod. A special clamp is next fastened in position, and as this is made with open washers to slide under the bolt the clamp is quickly placed. It will be observed that the clamp is made with a contour of half a vee-block, thus locating and holding the large end of the rod securely. In the centre of clamp is placed a wedge, and as this is slid across the clamp it forces out a steel block against the small end of the rod, this in turn pushing over the small end of the rod against the fixed block. The two ends

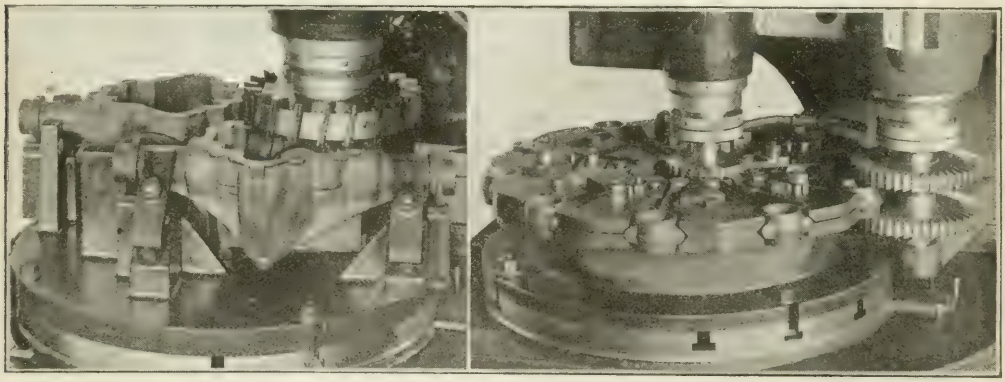


FIG. 2—MILLING DIFFERENTIAL GEAR HOUSING.

FIG. 3—MACHINING TEN AUTOMOBILE CONNECTING RODS.

of the rod are milled at once, using two sets of gauged cutters accurately spaced, and 90 complete rods can be obtained per hour.

The machining of the element shown in Fig. 4 is of interest, this being a clutch shifter yoke, also used on an automobile. The fixture designed for this work is illustrated at Fig 5. The forgings are placed into the fixture, being located for height by resting on adjustable pins at the lower end; this ensures that the surfaces machined will be in the correct location. The stems of the shifter rods, which have been turned in a previous operation, are located in vee-blocks at both ends, and the U parts of the forgings are placed between two pins to bring the pieces into the proper relative position to suit the cutters. The clamps are then tightened down, as shown. Four surfaces are machined on each forging, the cutters being properly gauged to obtain the correct spacing between the machined bosses.

It will be seen that the machine has been provided with a supporting arm at the lower end of the cutter arbor. This is a very useful addition, as the head is some distance away from the cutters owing to the construction of the fixture, and, further, the material removed is larger than under ordinary conditions where the arbor is only held above. With the arrangement shown the production obtained was 195 complete shifter yokes per hour. These examples will illustrate to the reader the great field yet open for experiment in continuous milling. It will be noticed that the fixtures required are not elaborate and that the increase in production soon offsets any expense that the investigations may require.

SLEEPING CAR FOR TRAILER WORK

The latest use of the trailer is to adapt it for sleeping and eating accommodation for crews of workmen engaged in line-construction work for the Pacific Telephone and Telegraph Co. in California.

A train of trailers affording comfortable and sanitary living quarters for 35 or 40 men is drawn from place to place by a motor truck as construction work progresses or the work-gang is moved. Each train is made up of two sleeping cars, one combination sleeping car and office for the engineers and superintendent, one dining-car and a combination water-tank and tool car. The motor truck which draws the train of five trailers is detached on arriving at the scene of operations and used for hauling materials, etc. All the trailer chassis are of 2 tons capacity and the bodies are of railway type, 8 feet wide, with sliding windows. Length varies from 12 feet to 24 feet, the longer trailers having reversible or double-end steering control.

COLORING STEEL

A hot mixture of 1 part black oxide of manganese and 10 parts saltpetre by weight will, according to Mechanical World, act as a good medium for coloring steel articles. The mixture should be heated in an iron pan set in a brick furnace using gas, oil, hard coal, or coke as fuel, and stirred with an iron rod before inserting the piece or pieces to be treated. The temperature may be gauged by immersing a pine stick, which should char without firing instantly. The piece should be moved up and down in the mixture until the desired color is obtained, then washed in hot soda, finishing off in hot water. The quality of the black finish this affords depends to a great extent on the finish of the work. If the articles are hardened, the heat of the mixture will draw the temper somewhat, but it may be restored by finishing off in cold water.

SPRING MEETING OF A.S.M.E.

The 1921 spring meeting of the American Society of Mechanical Engineers is to be held in Chicago May 23-26 at the Congress Hotel. Well developed programmes will be presented by the professional divisions of the society devoted to Forest Products, Fuels, Machine Shop. Management, Material Handling, Power, Railroad, and an important session will be devoted to Training for Industries. The Chicago committee, jointly with the Western Society of Engineers, is preparing a session on "Chicago as the Rail-Water Gateway."

Visits to a number of points of engineering interest in Chicago will be arranged. Special attention is being given to the correlation of plant visits with the technical sessions. En route to the meeting, the society, jointly with the Society of Automotive Engineers, will stop at McCook Field on Saturday, May 21, for an inspection of the facilities of the field. On May 27-28, the Friday and Saturday following the meeting, a joint excursion with the Army Ordnance Association will proceed to Rock Island Arsenal, where the ordnance division will present papers and enjoy an inspection of the plant.

The programme of the Machine Shop Division at these meetings will be devoted to the effect of the automobile industry upon machine tools and machine shop practice. Four important phases of this subject will be discussed by Henry J. Eberhardt, secretary of the Newark Gear Cutting Machine Co.; Henry J. Hinde, president and general manager, Toledo Machine & Tool Co.; R. E. Flanders, manager, Jones & Lamson Machine Co.; C. B. Lord, works manager, Advance-Rumely Co.

GASOLINE INDUSTRIAL TRACTOR.

The Barrett-Cravens Company of Chicago, Ill., has recently developed a small heavy-duty industrial tractor capable of carrying a load of 3,000 pounds, and made in a variety of styles to suit the needs and conditions of the different factories. The motive power is derived from a gasoline motor located in the front part of the machine. The drive is transmitted from the engine by means of a straight-line propeller shaft equipped with two universal joints. One casting encloses the rear shaft and the differential gearing, the latter being driven by means of a bronze worm. The wheels are cast solid and designed with invisible hubs to avoid contact with door frames or other obstructions. Wheels are provided with Timken roller bearings. Bumpers are provided at both ends of the machine.

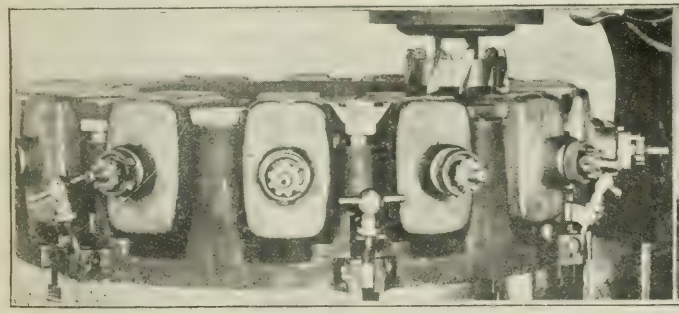


FIG. 1—MILLING MOTOR FRAMES FOR AUTOMOBILE STARTERS.

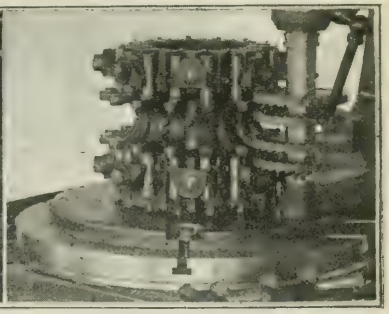


FIG. 5—FIXTURE USED IN MILLING YOKE SHOWN AT FIG. 4.

WHAT OUR READERS THINK AND DO

THE MONOTONY OF MASS PRODUCTION

By JOHN S. WATTS

As the mechanical arts advance, additional types of automatic machinery come into being. With this has been inculcated what is known as scientific management. In fact work has been pretty well reduced to the point where the fight for production should be tempered with an attempt to relieve the monotony of mass production.

It is readily conceded that the economy resulting from manufacturing in large quantities is too great to allow us to return to the slower individual methods, nor would anyone in an executive capacity assert tha the modern method of subdividing the work into operations that are repeated continuously does not become monotonous after, say, six months. Yet one cannot very well keep changing operators, for this would result in lower output, and an increase in spoiled material, not to speak of possible damage to the machines through lack of knowledge.

It is also well recognized that the higher the intelligence of the operator the quicker he will rebel against doing monotonous work. To those who perhaps do not agree with me as to monotonous tasks, let me suggest the following: Make rows upon rows of similar figures over and over again. Do not stop to sharpen pencils. Work only with prepared pencils. It will surprise you how soon you tire of the task. Better still, if you have a gang of men working for you at some set operation, take the place of one of these for a few hours, and you'll soon agree with me as to the monotony of it. What then is the solution?

To overcome the monotony by changes in the work, or in the operation, must, perforce, militate against the efficiency gained by the standardization of the work, but it is possible that even so this may be the best solution, and, if so, the point to be aimed at would be to make the changes just sufficiently frequent to make the monotony bearable, thus balance the efficiency lost in changing the work against that gained in retaining the trained operator. In practice this would most easily be accomplished by training each operator to do a number of operations, changing them from one operation to another whenever their efficiency began to fall off through the discontent engendered by the sameness of the work.

To change the method of doing the work would be difficult on operations other than hand operations such as assembling. But it would seem that if an operation has been subjected to a motion study, and the exact motions specified for the operation are followed consistently that the muscles used would from constant repetition of the same action become tired quickly, and that, even from the standpoint of the motion study expert, it would be better to have more than one set of motions laid out, then the operator could change from one to the other from time to time, bringing into action another set of muscles, at the same time relieving the monotony to some extent.

The above covers in a general way the possibilities that are open in the way of changes to the work of the operation, without departing too far from the essential requirements of repetition work.

Let us next take up the question of relieving or counteracting the effect of the monotony by some influence outside of the work. To determine what may be possible on these lines, we would do well to study those things which we do for pleasure, although some part of these things may be monotonous. Take walking. In itself it is a most monotonous thing, being a repetition of the same motion, just as the best examples of scientific motion study. Nevertheless this exercise is about the most universal form of amusement we have.

Analyzing the reasons why walking, though monotonous, can become a pleasure, we find that it is mainly because of what is to be seen during the walk, the pleasure being in the continual change of scene, and the expectation of what is to be seen. The performance of repetition work in a factory under scientific management is analogous to walking through a tunnel in its psychological effects, and the cure may be found in making this work analogous to walking along a pleasant country road or a busy city street.

The fact that we are able to control our muscular actions, as in walking, while at the same time using other of our senses to enjoy the sights, proves that we can think of more than one thing at a time. We may say, then, that it is possible for us to do work, which is simple in itself and calls only for a repetition of the same motions, and which can be controlled by one portion of our brains while the rest are idle, or enjoy some other sensation.

That class of work which requires the whole skill and intelligence of the worker, while being repetition work, cannot be monotonous, as its demands for continual concentration to overcome the difficulties arising furnish sufficient excitement to keep away the feeling of monotony. In fact, it is only that class of work which does not require the use of a fair percentage of brain power which is monotonous.

The operation of automatic machinery, or the execution of work by methods specified by motion studies, is monotonous, because as little as possible is left to the skill of the operator, and the less use that is made of his brains the more successful is considered the operation. Therefore the more we succeed along the lines of scientific management, the more monotonous will the work become.

It would seem necessary therefore to find some means to give this excess idle brain power pleasurable stimulus from outside. I say from outside, because to

HOW ABOUT THIS?

Has this story impressed you favorably or otherwise? We want readers' views on this subject, but request that replies be kept as brief as possible. Boil down your suggestions so that we get the real cream of the idea. It is perhaps not generally known that in some tobacco plants in Florida the monotony question has been thought over carefully with the result that a system is installed whereby a competent reader sits upon a raised platform and reads popular novels to the operators, while they are busy on their monotonous tasks. Judging from some of the popular novels we have read, we are of the opinion that this would not help to relieve the monotony—but why go further, for we are tempted to start what Mr. Watts terms a satirical criticism of the system—and yet it has brought wonderful results as far as we can learn.

leave it to the operator to furnish this stimulus from within himself is to invite disaster. This can easily be proved by a simple experiment, involving the doing of simple work, such as that of a draftsman section lining. This work used up only a small part of his thinking capacity, and if the section lining continues over a large surface, he will infallibly begin to think of other things to keep it from getting monotonous, frequently with the result that he becomes so engrossed in the secondary matter that he fails to control properly the section liner and makes some foolish mistake. Having to furnish some interest from outside the operator, it must obviously be done through one or more of the five senses with which we are endowed, namely, sight, taste, touch, smell or hearing.

The first, sight, is, of course, absolutely necessary. The second, taste, does not appear to hold much prospects of helping us, as it is obviously impossible to be using it continuously without danger of upsetting the digestion of the operator. It would anyhow be too expensive to feed chocolates to our machine operators, and, on second thought, we find that the operators have tried this themselves, the male ones by chewing tobacco, the females, gum, apparently with some good results, since they continue the practice, but with insufficient results, however, to answer our purpose, since it evidently does not entirely overcome the feeling of monotony. To encourage a still greater indulgence in chewing would be injudicious, as it has been known for operators, under sudden stress, to swallow their chew, with disastrous results to themselves and to the efficiency we are aiming for.

The sense of touch, like that of sight, is practically used up in the actual operation being performed, and is therefore not available for other purposes. That of smell holds possibilities, inasmuch as it is entirely dormant, in most operations (outside of a tannery), but to have a flower bed just outside the window is possible only in summer, and to have a spray of perfume descending upon a disgruntled worker does not appear to me as though it would cause a change for the better in his disposition, although I confess it would be very interesting to watch the effect of unexpected showers of varying perfumes on the operators, from a safe distance, of course.

We have left the sense of hearing, which is generally little used in the actual work, and is therefore available for our purposes. To attempt to use this sense by giving speeches or other spoken entertainment would demand too much attention on the part of the operator and need not be argued at length. The only distraction left is that of music, either vocal or otherwise, and it would seem possible to arrange, where the noise of the machinery itself was not too great, that something might be accomplished along this line, the point to be aimed at being to have the music just sufficiently varied and interesting to take up attention enough to relieve the monotony, without distracting it too much from the performance of the work in hand. That human nature itself seems to point to this as the desired outlet for its superfluous energy is indicated by the tendency to whistle or sing on the part of almost everyone when engaged in some simple, easily performed task. This whistling at work is an unfailing indication of the progress of the work, as when you hear a man whistling you may know he is progressing easily, but let him strike a difficulty and instantly he ceases to whistle and puts his whole mind to the solution of the problem before him and will not recommence his song until the difficulty is overcome and plain sailing is before him again. The action is automatic, the whistling ceasing precisely when its need ceases and recommencing whenever required, without in the least unduly distracting the attention from the work in hand.

When we come to think it over, we find that the military have used this idea for a long time, by having their own bands accompany the regiments on their marches. In the European war when it was impossible to have the bands accompany the soldiers, it was found a great help to start the soldiers singing when the tedium of a large march began to tell upon them. If, then, we had a leader, human or mechanical, to lead in the singing or whistling, whichever appealed to the individual operator, each one would naturally, without thought, join in, or drop out, just as the demands of his work upon him required, and sufficient variety be injected into the day's work to relieve the strain of monotony.

I strongly appreciate the possibility of someone writing a very humorous satirical criticism of the above, indeed I must confess to an insistent temptation to do it myself, as the possibilities of a really funny skit on this proposal are too good to lightly pass over.

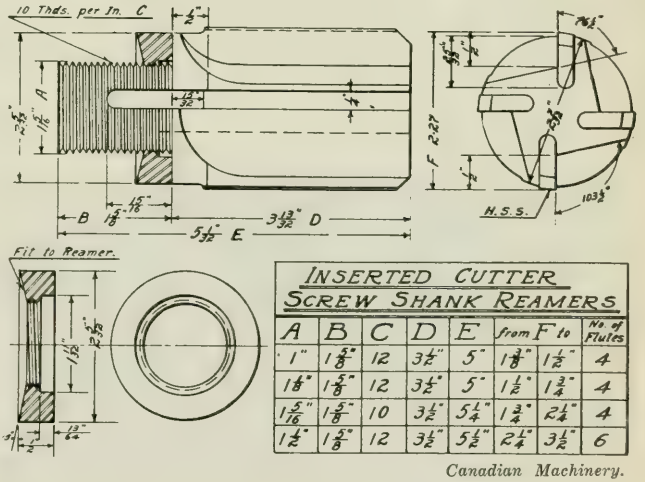
Nevertheless I put forward the idea, in all seriousness, as one that holds the solution of what is becoming a serious problem.

Reamer Data

An inserted blade reamer, to be a success, must be rigid. After many experiments, here is the type of reamer adopted by the International Harvester Co., Ltd., at Hamilton, Canada. As will be noted, certain proportions are adhered to, and the construction in itself is rather novel.

For efficiency in milling of blade slots, the washer as shown was made. Previous to that, the slots could not be milled far enough to allow the blade to sit down correctly, but now the slots are milled slightly farther than necessary and the washer on assembly takes the thrust of blade. A study of this style of reamer will well repay mechanics in general.

By J. H. Moore



INSERTED CUTTER SCREW SHANK REAMERS

A	B	C	D	E	from F to	No. of Flutes
1"	1 5/8"	12	3 1/2"	5"	1 3/8"	1 1/2"	4
1 1/8"	1 5/8"	12	3 1/2"	5"	1 1/2"	1 3/4"	4
1 5/16"	1 5/8"	10	3 1/2"	5 1/4"	1 3/4"	2 1/4"	4
1 1/2"	1 5/8"	12	3 1/2"	5 1/2"	2 1/4"	3 1/2"	6

Canadian Machinery.

HERE WE HAVE CONDENSED INFORMATION OF REAL VALUE. CLIP THIS OUT FOR FUTURE REFERENCE.

DEVELOPMENTS IN SHOP EQUIPMENT

SPLIT BELT PULLEY.

The S. K. F. Co., Ltd., Toronto, Canada, have placed on the market a line of new split belt pulleys which have some special features well worth mentioning. These pulleys are made in sizes from 8 inch to 60 inch diameter, these having a difference of 1 inch up to 24 inches, of 2 inches up to 40 inches, and of 4 inches up to 60 inches diameter.

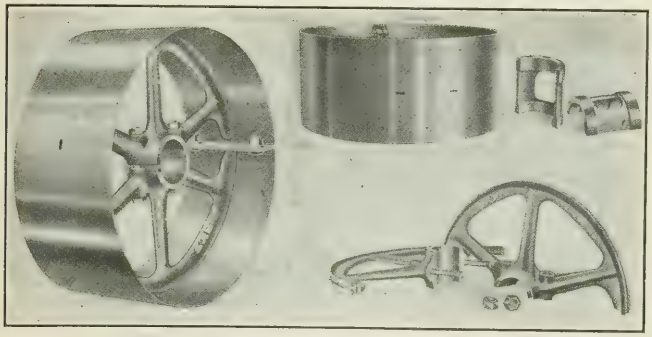
Standard interchangeable rims are made in widths from 3 inches to 9 inches, increasing by 1 inch for pulleys with single spyder, and with flat or crowned faces. For belts of greater width, pulleys having two spyders are made with rims 11 inches, 13 inches, 16 inches, in one width, and with flat face only.

Reference to the illustration tells the story in itself. As will be noted, the pulleys consists of the following parts: A cast iron spyder made in two similar halves is provided with suitable fastening bolts. These halves are machined to receive interchangeable shaft bushes, or S.K.F. ball bearings of the adapter type as necessary. The periphery of the spyder is machined and a groove cut to receive the snugs (as they are called) formed in the rim by press tools, this, of course, preventing lateral movement of the rims. The adjacent ends are notched to locate rim balance weight.

The rim is made from suitable quality steel to withstand high tensile strength, and is finished by cold rolling. The ends are flanged and pierced to receive the two stretching bolts. A balance weight of sheet iron is placed within the rims when assembling, and is located by notches as already mentioned. No shaft keys are required on this style of pulley as they are intended for line shaft drives to machines or main drives to line shafts from electric motors.

The chief feature in this pulley is the interchangeable rim. Its advantage is self apparent, for rims up to 9 inches wide are interchangeable with those of lesser width on the same spyder and bush where necessary. Intermediate drives to line shafts, up to 2½ inch diameter, originally installed for continuous driving, may be converted for intermittent use by the substitution of a wider rim with flat face on the driving pulley, and the addition of a second driven pulley with crowned face, into which may be inserted ball bearings of the adapter type to carry the belt as a loose pulley.

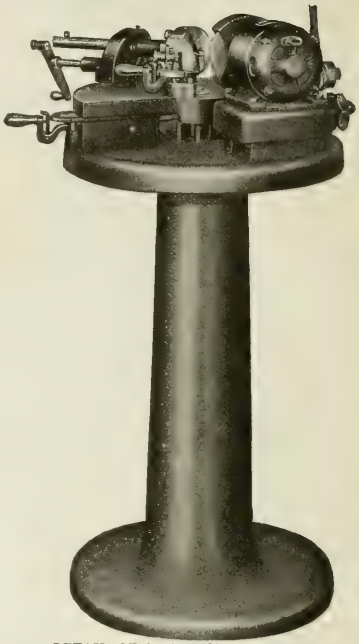
It might be imagined that the adoption of the bushing system without keys would limit the use of these pulleys to light duty drives. However, this is not the case, for the company claims that they recommend with confidence these pulleys for main drives which are reasonably steady, such as those from electric motors to line shafts, driving machines in groups where a main belt is working at 3,000 feet per minute, or more; for instance, a line shaft speed of 250 r.p.m. transmitted through a pulley 48 inch diameter. It is, however, in the case of line and countershaft pulleys, where these pulleys will find their greater scope.



VIEW SHOWING DETAILS, ALSO ASSEMBLED PULLEY.

DRILL GRINDING MACHINE

The Bickford-Switzer Co., 50 Norwood Street, Greenfield, Mass., has recently placed on the market the drill grinding machine as illustrated. This machine is intended for the sharpening of twist drills from ⅛ inch up to ¾ inch diameter. Drills can be ground commercially perfect at considerable speed, according to this company's literature, and it is said that a drill ground on this machine will not cut more than .002 inch larger than its own size. One minute only is required for setting up and grinding. The drill is held in a chuck, and by turning a crank is given a combined rotative, eccentric and swinging motion. The two lips are brought consecutively in contact with the wheel, with the result that when one lip is sharpened or ground to a certain point, the other is also. The grinding is said to be always central and true with the axis of the drill. The shank end of drill is held by means of a cup center, while the front end is held by two jaws which locate and grip the body of the drill.



DETAIL OF THE DRILL GRINDER.

The abrasive wheel is enclosed in a guard, and driven directly by means of a

small electric motor, which can be furnished for either direct or alternating current. It can be fed towards the drill, being sharpened by means of a small handwheel.

After clamping the drill in place in the chuck, the carriage on which it is mounted can be moved toward the wheel by means of a hand-lever moving horizontally. The crank at the left is then turned, so as to produce the necessary motion of the drill. In this way the point of the drill is ground and sharpened. The mechanism is arranged so that it is also possible to bevel off the center corners of the cutting lips, it being stated that this method increases the endurance of the drill.

SAFETY PRESS GUARD

Kartzmark and Sons, Hamilton, Ont., have placed on the Canadian market a new press guard known as the Kartzmark safety guard. This guard, although well known in the States, has never been brought into Canada until the present time. Various firms on the other side have them in use at present.

The illustrations shown herewith show its general characteristics. The guard works with the press. At the downward movement of the treadle of the press, the guard moves down. It must go down all the way, that is, it must go down and settle over the block of the die, for the latch on the guard remains locked until it does. As will be noted in one of the illustrations, the operator's hand upon the block locks the latch we speak of and halts the hammer. In this way the careless operator receives nothing worse than a slight squeeze for his carelessness.

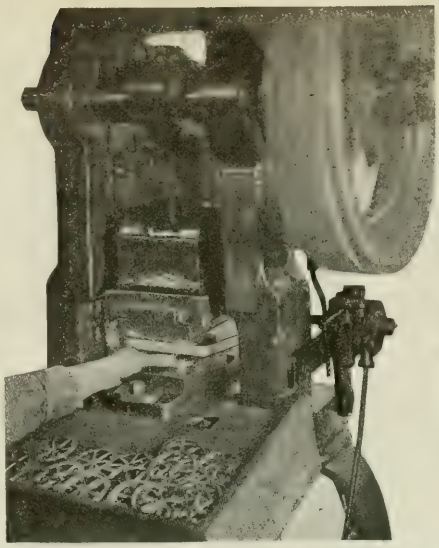
It is stated by the manufacturers of the device that production is not deterred through the use of the guard, but 15% to 35% additional work has been obtained in many cases. The positive self-guarding features and mechanical construction of this guard are fully protected by suitable patents.

BALANCING AND DRILLING MACHINE.

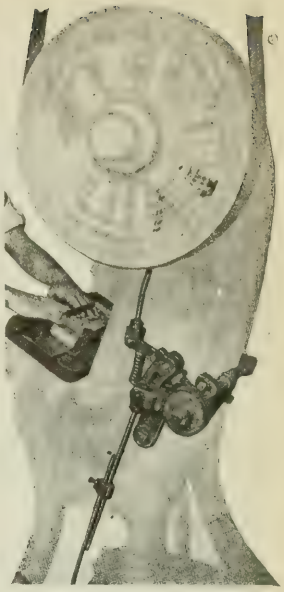
A combined balancing and drilling machine has been added to the lines manufactured by the Rockford Tool Company of Rockford, Ill. It is designed for the final balancing of crank shafts and flywheels after they have been assembled. The same fixture may be used for similar operations where the flywheel is carried on an arbor or mandrel. In the latter instance the drill passes through a bushing in one of the standards which guides it to the work. Ball-bearing spindles are provided for the balancing discs, which are made of hardened steel. The machine can be arranged for belt or motor drive.

SHAPER GUARD

The Lang Manufacturing Co., Guelph, Ont., have placed on the market a shaper guard as shown in the accompanying illustration. This is known as the Whetstone guard, and it is for use on all classes of woodworking. The fixture requires only one hole in the work table, and is said to give the worker absolute protection against the revolving knives. The guard has a swivel arm as shown, and can be adjusted to any angle, at the same time holding down the stock securely. The fixture is equipped with a roller of rubber for finished stock, also with a shoe for working on long stock.



SHOWING HOW THE PUNCH CANNOT INJURE THE HAND.



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CANADIAN MACHINERY
AND MANUFACTURING NEWS

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The Rate of Wages

IT is, perhaps, only natural that labor should make a fight to maintain wages that were paid during war years.

The trouble that is being experienced to-day in readjusting wage schedules to conform with to-day's conditions is the price we are paying for ever allowing war work to get on a money-grabbing basis.

Once a man gets his wages on a higher level, he brings up his home conditions—and when there is danger of this increase being taken away, he has the backing of the home to a large extent in resisting such a move.

A man who is employed has only one thing to offer for sale, viz., his labor power. It makes no difference in what capacity he comes. He may prefer the word "ability" or "services" to "labor power," but it is a distinction without a difference.

He sells his labor power according to the market value, the same as any other commodity is disposed of. If the market is in his favor, then he is in a seller's market and can get his price. If his commodity, labor, is a drug on the market, then it is a buyer's market, and the man who has labor to sell ceases to be in a position to dictate either figures or terms.

There may be some exceptions to these rules, but they govern the great majority of cases.

To-day the buyer of labor is in control of the market and he has to regulate the price he can pay in accordance with the price at which he can sell his finished product in the lowered markets of the world.

We are all subject to certain economic laws and little is to be gained by trying to make ourselves imagine they have ceased to operate.

Every speaker of any prominence who assays to discuss public affairs has told us what is wrong with our National Railways. And summed up, the address runs like this: "The C.P.R. is a well managed affair."

An Evening Well Spent

HAVING answered the questions in the weekly contest in Canadian Machinery, an official of one of the leading machine tool firms in United States writes: "Your contest is all that you claim, and it proved to be not only interesting, but constructive as well, which no doubt is a view taken by many of your readers. Your magazine afforded me many hours of interesting reading and it was not until I had read every article that I decided to try the contest. I considered it an evening well spent."

A Need of the Times

SELDOM has such a straight and accurate analysis of conditions been presented as that contained in an address by James S. Alexander, president of the National Bank of Commerce in New York. Addressing the National Association of Cotton Manufacturers at Boston, he made use of the following:

"Too many people to-day hope and expect something will be done for them although their interests would be best served by their doing a full day's work for their pay. There is an effort on the part of workers to retain the advantages won during the abnormal war period of shorter hours, higher pay and easy work, regardless of the present lack of an economic basis for the continuance of such conditions. The fundamental principle of enlightened labor leadership to-day should be to inculcate a return to the doctrines of an honest day's work for an honest day's pay. Inflated wages and the non-competitive conditions of the war and the later boom period produced inefficiency and irresponsibility.

"It is essential to the welfare of labor itself to banish this attitude, not because individual efficiency and a full return of value received in the pay envelope mean bigger profits for the employer, but because they mean better times for the workers themselves. Workers cannot, in the long run, consume more than they produce. If wages are too high in relation to the exchange value of the product, wages must come down, for no wage can be permanently maintained at a point above what it is worth measured in terms of other products.

"Further, employers must not seek to drive wages below their true value thus measured. There is this reciprocal personal responsibility involved in the relation of workers and employers,—on the one hand to render efficient service for every dollar demanded, on the other to render over to labor every dollar earned."

Not only is there a responsibility for employers and employees, but also for merchandising business in general. Without the active co-operation of retailers to quickly give consumers all possible advantage of lower prices, it is going to be a hard matter to make wage adjustments on a fair basis and unless they are made on such a basis, they are going to be neither satisfactory nor permanent.

Some Good Issues Coming

MAGNETIC chucks will be discussed in an interesting article in May 5th issue of Canadian Machinery. The particular consideration will be their application to surface grinding. The magnetic chuck is coming into its own in the mechanical field in a way that would surprise and amaze the old-timer.

Then in the issue of May 12th, roller bearings in industry will be featured. This is a matter that should be of particular interest to executives generally.

An expert in the business is furnishing the leading article for May 19th, which will deal with the method of gear shaping automobile gears. Various fixtures used in doing this work will be shown.

Every issue has something of direct interest to the practical shop man.

EFFICIENT FOREMEN GREAT HELP IN RUNNING THE SHOP

Mechanic Needs to Have a Good Training and Education to Live Up to His Opportunity

By N. W. K.

"WHAT is the greatest problem you have to face in the management of your plant?" I asked Mr. Kenneth Dunn, superintendent of the McClary Mfg. Company.

"The difficulty of obtaining good foremen," was the immediate reply. "And what I mean by good foremen are men who are fully trained, both technically and as executives—men who can figure on estimates and costs, understand time chart principles—in other words, men who can be relied upon to administer their different departments efficiently."

Mr. Dunn went on—"The trouble with the average foreman of to-day is that his early education has been sadly neglected. That's not the man's fault. It's the fault of the educational system. By far the greater number of to-day's foremen started to serve their apprenticeship at very immature ages, many of them just at the age when they should have been developing their brains instead of their arms.

"You know, I am a firm believer in every boy being fitted for life with a proper education. Every boy should have at least a few years in high school. A great many of the things we learned in high school were looked upon by us at the time as unessential, especially," he continued, "subjects like Latin, Greek, algebra and numerous other studies so irritating to the average boy. But in reality subjects of this sort are splendid brain food and teach a boy to think for himself, a faculty with which every man must be endowed if he is to go far in the industrial world to-day.

"The manufacturer of to-day wants as foremen men with brains who know how to apply them. Keen business competition demands this. Every effort is being made to cut down costs and excessive costs are in the main due to inefficient methods and wastage of material, due to ignorance on the part of the employees. Now it's up to the superintendent to see that a plant is run economically and efficiently, but where he has many different departments in his care he must depend on his foremen and if these fail through lack of education to keep their end up, well, something's going to happen."

"Do you think an intelligent reading of technical books and papers would go far towards solving the trouble?" I asked.

"Well, yes, to a certain extent," he replied. "Personally, I'm a great believer in technical papers and subscribe for a great number. What I have in mind, however, is an improvement even on the technical paper. Some of the most prominent American universities, such as Yale and Columbia, are strongly advocating the training of promising workers in the various branches of industry who will later develop into good executives. This matter has received the co-operation of many of the leading American manufacturers, who are sending some of their more promising workers to these universities, where special courses of study in executive and higher technical training are given. I am firmly of the opinion that this will become a regular practice with our own Canadian manufacturers when such courses take their place on the regular curriculum of Canadian universities."

"Iron Age"—Workers at many iron and steel plants have accepted reduced wages; lower prices have been named on many iron and steel products. Farmers have seen the prices of their products decline until all profit on their 1920 crops has been wiped out. Both manufacturers and wage earners in many lines are now looking to the railroad workers to accept such reductions as will make possible a lowering of freight rates and aid in the readjustment for which the whole country is waiting.

A Man of Many Parts

IN an appreciation of the late C. E. Duncan, general superintendent of the Algoma Steel Corporation, appearing in "The Algoman," of Sault Ste. Marie, is the following:

"To many, Charlie Duncan was a formidable man, a man hard to meet, hard to talk to; they feared him. But humanity being the peculiar characteristic of all great men, he was an eminently human fellow—in fact a great big boy, in heart. True, he was gruff and abrupt, at times; his was a rapier tongue in repartee; he was a great judge of human nature and a great manager of men; he knew the steel game from top to bottom; he detested subterfuge and camouflage; it was useless to try to resort to such with him. They wouldn't pass muster. He knew all the tricks. The only way to corral his interest and goodwill, was to go absolutely straight with him. Then he became your backer and friend and champion against all comers.

He dearly loved a fight, even for the fight's sake or to try out the mettle of a subordinate and he well nigh despised any one who feared him. He told the writer an incident illustrative of this, some weeks before he died. He said that, once, he had had occasion to give a department head a "raking over the coals" about something. This latter felt very badly over it and came to his office almost in tears, to explain the matter. "Do you know," he proceeded, telling of it, "I'd have thought ten times more of that chap if he had burst open my office door, thrown his hat on the floor, jumped across my table and bearded me, saying,—'See here, Duncan, d—— you, what do you mean by jacking me up this way?'"

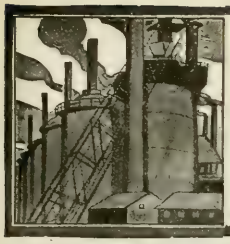
Using the Bulletin Board

THE use of a bulletin-board as an educational feature is a valuable asset when utilized in a common-sense way and without fear or favor. At a time when business conditions make changes in the plant necessary much of the fear of these changes may be removed by the right kind of explanation on the bulletin-board. J. H. Lloyd, in "The Iron Age," comments as follows:—

"Within six months after bulletin-boards were placed in a forge shop every one of 155 men was converted to bulletin-board principles. Increased production resulted, and there was a material decrease in the consumption of fuel oil, fire brick, light, and so on. At the end of every month letters from the assistant manager, showing what had been accomplished in cutting costs, were posted on the bulletin-board, so that all could read them. A bulletin-board exerts the same power that a newspaper does."

WRITING to the Brantford Expositor recently on "What Is Brantford's Greatest Need," A. B. Muir, of the Goold, Shapley & Muir Co., says: "Brantford's greatest need at the present time is for the farmers to stop holding off from buying the implements they are in need of, with the expectation of a big drop in agricultural implements. Generally speaking, manufacturers have been hit hard the past few years by the great increase in raw materials and wages, not being able to increase their prices in proportion. Most of the farmers have made their old machines hold out longer by repairing. Perhaps a number borrowed their neighbor's and some rented others. This is the chief reason for the slump in employment and industrial stocks at the present time."

ON the front cover of Canadian Machinery is a little "Read and Pass On" table that is becoming quite popular in a number of shops where the paper is send from one department to another. Very often one member of the staff will see an article that he knows will interest some person in the organization—it probably contains information he should have. The little "Pass On" table makes it easy to send this on through the office mail in the usual way.



MARKET DEVELOPMENTS

Only One Recognized Steel Market is Left Now

Prices Have Been Equalized, And it Seems Certain That There Will Be No Change For Some Months to Come—First Month In Second Quarter Shows No Marked Change

THE first month of the second quarter has passed, but there has been no noticeable change in business in the iron, steel and machine tool market. There are lines where the new prices of steel will not be felt for some time to come. Implement makers, for instance, will in many cases not be using the lower priced steel until well on in 1922, as they have a lot of stock on hand to be worked up and also a large supply of machines made up but not sold. Many other industries are situated similarly.

Canadian steel merchants are not finding any difference in their bookings since the new prices came into effect. There seems to be a feeling that the schedule will hold for some months to come and from this there is no doubt more strength to the market that will have a tendency to keep prices from sagging, but there is still a lot of material on hand that merchants are anxious to clear out at whatever they can get for it. Buyers are always keen to try and build market values around a cut price that may have very little relation to actual conditions at all.

Machine tool trade is quiet and the bringing out of quite a lot of used equipment is not helping the sale of new machines.

An official of the largest firm of scrap metal dealers in the Dominion puts forward an interesting claim for his business this week. He remarks that fully fifty per cent. of the dealers have gone out of business during the past few months and adds: "There will be no improvement in business until there is an improvement in the scrap metal trade. Iron and steel will not move well until the iron and steel scrap lines have started to rise. The same will hold true in regard to copper. It has happened in every period of this nature before. Coming events cast their shadows before, and they fall in the scrap yards. Watch and see," he concluded.

VARIED REPORTS COME OUT ABOUT CONDITION OF TRADE IN MONTREAL

Special to CANADIAN MACHINERY.

MONTREAL, April 28,—The steel situation in this district has steadied considerably following the adjustment of prices by the United States Steel Corporation. There have been no pronounced signs of increased buying, but the added confidence that has been created by the knowledge that price quotations have become more uniform will probably have the desired effect upon the trade. There is no definite assurance that prices are as low as they will go, but it is almost certain that no further reductions will be made for some time.

"One thing that has developed as a result of the lowering of prices by the Steel Corporation," said a dealer here, "has been the establishment of fixed prices on many lines of commodities. The range of quotations that prevailed a few weeks ago has practically disappeared, as nearly all the independents have adopted the figures set by the Corporation. We tried to purchase a lot of plate from a mill that a couple of weeks back were quoting around $2, but were advised that the price was now $2.20. Reports seem to confirm the belief that the Corporation's quotations on plates are now quite general." When asked as to the possible period through which this new price list would be effective, the dealer would not commit himself. "We would not care to make a prediction as to the duration of these quotations, but it is reasonably certain that no material change will take place for some time. The labor question is still unsettled and this is the pivot on which conditions swing. The new price quotations may be based on premeditated action regarding labor, and if so, prices may remain unchanged even after labor is cut; but on the other hand, it would not be surprising to see a further decline before midsummer."

Apart from slightly increased inquiry the market has not been affected by the developments in the States. Dealers here state that the motor trade is more active and that sales have increased to some extent, but general demand for other lines remains unchanged.

Machine Tool Inquiry Improves

The varied remarks of dealers as to the business being carried on makes it difficult to define, with any degree of accuracy, the present status of the machine tool situation. The statements range from "very dull" to "the best week we have had this year." These conditions, however, could be likewise qualified, particularly the latter, as the "best week" might be considerably below what would be thought normal for this time of the year. Apart from the actual receipt of the orders, there appears to be a better tone regarding the summer's business.

"We have had some good inquiries," remarked a dealer, "and are expecting that they will be followed by business very soon. We have disposed of quite a bit of wood working machinery and construction equipment during the past few weeks. Metal working lines are not very active but a fair volume is still moving."

Non-Ferrous Lines Back

Aside from the fact that scrap quotations on non-ferrous lines have been revised upwards, after a couple of weeks at what might appear ridiculously low prices, the market has developed nothing of exceptional interest. The low prices quoted brought few inquiries owing to the fact that the trade is not buying and producers of scrap have little available material. The dullness of trade at the present time makes price a secondary consideration. Scrap dealers look for a quiet period throughout the summer, and do not anticipate any marked change

until steel industry in general becomes more active. Dealers are quoting 8½ cents on light copper and from 10½ to 11 cents on other grades. Medium brass has returned to 5½ cents per pound. Steels are quiet with few changes. Machine cast iron is quoted locally at $22.50 per ton, and car wheels at $25 per ton; these are the only changes.

MOST ORDERS ARE FOR SMALL AMOUNTS

Scrap Markets Have Only Half the Dealers That Were In a Few Months Ago

TORONTO.—The machine tool trade moves slowly. In some places one hears reports of a better month's business than was done during the same period a month ago. None of these claim anything big in the way of sales or prospects, and at best they are running well behind the showing of last year.

If business is going to come as a result of the salesmen going after it, there should be some returns shortly. Anything that looks like a prospect is being cultivated to the fullest extent, and the chances are that any known prospective buyer knows more about machine tools now than he ever did before, that is if he has given a hearing to all the men who have started in his direction.

Fortunately the warerooms in this district were not carrying much stock when the recent reductions in prices were made. During the last year or so of the war, and for a year after, it was almost impossible to place a stock order for any of the well-known makes of machine tools, the makers insisting that dealers should be supplied only with bona fide sales shipments. While this seemed a poor condition at the time, it has since worked out for the best, as dealers have not had the trouble of having to dispose of high-priced machines after the makers have announced reductions.

The sale of small tools is limited to actual needs. In some cases dealers are hardly getting the trade that would come in the ordinary way. There are several shops that have close working connections with others, and supplies are shipped from one to the other, in order to make available supplies last as long as possible. An anxiety to get high-price tools worked out may also have something to do with this habit.

Carbon drills are in demand in many of the orders that are going through now, which means that the turnover of the dealer is smaller owing to the lower price of the carbon as compared with high-speed. For instance, half-inch carbon drills are selling at $1.86 against $7.35 for high-speed in dozen lots.

Steel Markets Spotty

Steel merchants differ in the reports they have to offer about the business that is being done in their warehouses. Some of them have made good progress in the work of getting rid of their stock, while others are still busily engaged in selling off. It is this practice of clearing out that makes it harder than usual to state market figures that will be found correct under all circumstances. Some of the warehouses that find a chance to get rid of a large tonnage in a line they do not wish to handle will give a close figure in order to move it out. In other cases the stock, which was taken in when dealers were glad to get anything that looked like steel, is not up to the standards in the way of size and length. A close price is not a market price, but it is remarkable how these few low prices that have been given are carted around the market, and what publicity and prominence they receive. The fact that one lot of bars was sold in this market at 3.40 was picked up by the writer at a number of points. As stated before in these pages the new market for bar mill material must be built around 4c., and it is difficult to see how, having regard to new prices and present costs of doing business, a profitable trade can be done at a lower figure.

Orders continue to be small in the steel warehouses. Perhaps the limit was reached when one of the yards sent out an order that weighed four pounds.

Gets Some Business

Another warehouse had advertised a certain line in several papers, and followed this up by a circular letter. A few days after a salesman started out to follow up in the next step, and a certain amount of business rewarded the effort.

Still another dealer, commenting on this, says: "It takes more than a low price to close the business just now. The low price can pretty well be taken for granted. Any salesman who goes out now is empowered to name a low figure, but it takes real selling plus the low price."

Some of the merchants from the steel market have found out that during the pressure of a year or so ago some of the smaller industries, when they had an opportunity to buy, took on a much larger tonnage than they can get away with now with business moving on a much lower scale.

Number Dropping Out

A representative of one of the largest scrap metal yards in the Dominion is authority for the statement that about 50 per cent. of the scrap metal yards in the country have gone out of business during recent months. "Only the well-established yards can stand such a period as we have been going through, and there is nothing to indicate an improvement. The scrap metal market must improve before other lines do. This may seem to be a queer statement, but it is an absolute fact, and anyone who watches markets over a period of years can prove that it is so. Until the prices of iron and steel scrap strengthen you are not going to see an improvement in the lines into which these go. Until the copper market gets better you are not going to see an improvement in the lines into which copper goes. Coming events cast their shadows before, and they fall right in the scrap yard. Watch and see," was his parting advice.

POINTS IN WEEK'S MARKETING NOTES

Pittsburgh reports that the whole steel market is now equalized as both the Corporation and independents are quoting the same prices.

The independent steel mills are rolling about 40 per cent. of their capacity now against 32 in March and 30 in February.

Small tools are moving slowly just now. Some English made drills are selling below the Canadian-made article.

The process of clearing out stocks in the steel warehouses is still going on and a good many sales are made at prices that do not reflect actual market conditions.

The scrap metal market continues poor. It is estimated that at least 50 per cent. of the dealers have gone out of business during the last six months.

The largest dealer in scrap metals in Canada makes the interesting claim that there will be no improvement in the iron and steel business until there is a strengthening in iron and steel scrap prices.

PRICES HAVE HELD BUILDING BACK

Cleveland Prospects May Change After the Matter of Wages Comes to a Showdown

CLEVELAND, April 27.—One reason for the slump in American business is the high building labor cost, and the refusal to lower the same. The Cleveland Street Railway employees took a reduction of 20 per cent., in fact they volunteered to put this into effect, but the building trades are holding out, and May 1 will see the climax when present contracts expire.

The following are some of the rates now in effect on some of the trades:

Plumbers, steamfitters and electricians, $1.39½ per hour.

Carpenters, bricklayers and steel contractors, $1.25 yer hour.

Hod carriers and laborers, $1 per hour.

Cleveland has through sheer necessity completed this last year some large office buildings, five theatres, and also has several under construction. Other than from sheer necessity nothing has been built since 1916, but after the fight on May 1 there will be a revival in building and conditions will improve.

INDEPENDENTS HAVE PICKED UP AND ARE RUNNING AT BETTER RATE

Special to CANADIAN MACHINERY.

PITTSBURGH, April 28.—Practically the whole steel market is now equalized as between the Steel Corporation and independents, as both parties are quoting the same prices, and the market may also be considered stabilized since there is very little chance that in the near future the Steel Corporation will reduce its prices farther or that the independents will cut prices.

Steel prices are now quotable as follows:

Billets	$37.00
Slabs	38.00
Sheet bars	39.00
Small billets	39.00
Forging billets, f.o.b. Pittsburgh or Youngstown	42.00
Rods, Pittsburgh	48.00
Bars	2.10c
Shapes	2.20c
Plates	2.20c
Hoops	2.75c
Wire	3c
Wire nails	$3.25
Standard steel pipe	.....62½ per cent. basing discount
Blue annealed sheets	3.10c
Black sheets	4c
Galvanized sheets	5c
Tin plate	$6.25

The Steel Corporation

As to the future of prices, it is plainly the present policy of the Steel Corporation not to reduce its prices farther, until conditions change fundamentally. The Corporation would hardly reduce prices farther without reducing wages, and it does not desire to do this, at least at present. There is a possibility that it would be disposed to reduce wages after two adjustments now in abeyance are made, these being wages and working conditions on the railroads and in the building trades respectively. However, even at that the Steel Corporation might modify its wages considerably without furnishing a basis on which a reduction in its selling prices could be predicated, because it contemplates at some time eliminating the twelve-hour day, though not necessarily by replacing it with a straight eight-hour day as carelessly assumed and commonly reported, and in that way incomes of men might be reduced without the wage cost of producing steel being made less. The Corporation has absorbed several large items as it is. The Industrial Board prices of March 21, 1919, being regarded as fair, the Corporation has:

(1) Absorbed the wage advance of February 1, 1920.

(2) Has absorbed the freight rate advances of August 26, 1920.

(3) Has absorbed the recent reduction made in its selling prices from the Industrial Board schedule.

The Independents

The independents are in no mood to indulge in another crusade of price cutting, for several reasons. The recent cutting, from about the beginning of February to the early part of April, did not bring them much business, and it is plain now that there is not a great deal of business to be had, not enough to give them an economical operation. If they had a light operation at present prices and could get a full operation by cutting prices slightly it would pay as their costs would be greatly reduced, but the additional business, if any at all additional could be secured, would not give them enough lower cost to justify the concessions. This is the theory, one that all the independents subscribe to now, but, of course, it does not follow that the independents will never cut prices again. They may become restive after a time, or suspicious of each other.

Manufactured Steel

Some manufactured steel products, made from the regular rolled steel products of the mills, have lately been reduced, and a little summary may here be given, the following prices being those now accepted as representing the market:

Standard railroad spikes	3.30c
Small spikes, ½, 7/16 and ⅜-inch.	3.65c
5/16-inch.	4.25c
Boat and barge spikes	3.85c
Track bolts	4.50c
Cold finished steel bars	3.10c
Cold rolled strip	5.50c
Button head structural rivets	3.50c
Cone head boiler rivets	3.60c
Chain, 1-inch proof coal	6.35c

Some of these prices are more or less in keeping with the prices of the rolled products from which they are made, but others show much larger percentage spreads above the raw material than obtained before the war. That is probably true of the majority of things made from steel, so that the ultimate buyer, who is the real consumer, does not get the full benefit of reductions the steel mills have made. While the steel mills never think of criticizing their customers in a matter of this sort, it is obvious that the actual consumption of steel, if to any extent it is regulated by the price the consumer must pay, is not entirely subject to the dictation of the steel mills, in their making of prices at which they will sell their products. In some quarters outside the trade, including some banks and John Skelton Williams, former controller of the currency, there has been criticism of the steel mills for not reducing prices, on the ground that the steel producers could broaden the consumption by reducing their prices. This criticism, it will be seen, is not altogether well directed.

Orders

The independents seem to have corralled a fair-sized lot of business as they were withdrawing their old prices and advancing to a somewhat higher level, and this is giving them a somewhat better operation for a time, say an average rate for the independents as a whole of about 40 per cent. of capacity, against about 32 per cent. in March and 30 per cent. in both February and January. Since prices were equalized the independents have booked very little fresh business, and they are hardly likely to just at present, considering particularly the fact now developed that in some commodities the extreme prices done were much lower than the prices commonly quoted. Before the readjustment, for instance, carload lots of black sheets were quoted at 3.75c and carload lots of galvanized at about 4.75c, but it is now admitted that sales were made at many dollars a ton below these figures. The buyers involved, therefore, will hardly be in haste to make additional purchases at the 4c and 5c prices now being quoted.

As to the Steel Corporation, it is booking very little absolutely new business, and does not expect to do so. Its business must come in the form of releases against orders previously suspended, and in specifications against old contracts, the Corporation having reported 6,284,765 tons of unfilled obligations as being on the books March 31. Thus far not much increase in releases and specifications is reported, but some is to be expected. The Corporation operated at 40 per cent. of capacity or a shade less in the past two weeks, and it is quite possible may get up to a 50 per cent. operation within the next two or three weeks.

Pig Iron and Coke

Bessemer, foundry and malleable iron remain quotable at $25, valley, there being no new developments. Last reported transactions in basic iron were at $23, valley. Lately several producers, particularly steel works, that had been quoting $23 have gone up to $25, but there appears still to be some $23 iron offered. Demand is very light. The rumor that the Sharon Steel Hoop Co. has just bought 5,000 tons of basic at $22.50, valley, is wholly without foundation. The company did not buy and was not even in the market. The United Alloy Steel Co. has had an inquiry out for 10,000 tons but is hardly expected to buy any tonnage.

BELIEVES PRESENT MARKET IS ABOUT AS LOW AS COSTS PERMIT

IN a recent issue of Iron Age, H. H. Pleasance, of the United Alloy Steel Corporation, has an interesting letter dealing with practices in the steel market, and making some rather pointed comments on market tendencies. The letter follows:

So much has been said and written on the subject of the immediate future of the steel business that consumers have been awaiting the recently announced price schedule with unusual interest. Their future business depends fully as much upon the stability of the steel market as does the steel business itself.

If the consumer could only realize that the last schedule published really brought prices down to the lowest possible level and a safe one for the rest of the year little attention would be paid to current pessimistic rumors preparing for a big midsummer slump. The industry as a whole has adjusted itself as far as it can, at least until the present surplus of steel scattered all over the country is used up. How can we possibly expect normal business unless there is an immediate realization of the present schedule as equitable for the year 1921?

Just as soon as a sale is made that is below the present schedule everybody jumps to the conclusion the market has gone to the dogs. You who undertake to keep the country posted on market prices jump at the chance to tell the public that the price has already been shaded. The real facts are never brought out. Very frequently sales are made of material that has been held in stock for a long time. The analysis may be somewhat out of line and the producer offers it at a figure merely to liquidate his inventory. At that moment this new price is published, and the consumer becoming fearful of the shadow, crawls into his hole until winter is over. He persists in assuring us he too can buy at prices of his own making.

This process cannot be eliminated but it can be reduced. We all realize this is a buyer's market, but is the buyer growing fat on his price reduction propaganda? We claim not. He will realize it, too. But will he wait until we are in the midst of the worst slump we have yet seen—probably—unless we unite to stop it? During the war every industry pledged loyalty to our Government and gave it 100 per cent. Why not encourage industry by pledging that we will continue the present schedule for the remainder of the year and dispense with current reports which tend to disturb business and postpone more indefinitely the date of normal production, full dinner pails and a prosperous United States of America?

H. H. Pleasance.

JAPAN WANTS THE SMALL POWER MOTOR

Department of Trade Wants Canadian Firms to Make a Bid For This Business

Yokohama.—Some months ago an inquiry was published in the Weekly Bulletin for small electric motors of ¼ and ⅛ h.p. for the Japanese market, but apparently no interest was shown owing to the fact that at that time Canadian manufacturers were fully occupied with domestic business. From the same source have again come inquiries for these motors, and Canadian manufacturers of electrical goods should not lose this opportunity of placing their products on the Japanese market. These electric motors are used for very many purposes in Japan. Electricity is procurable practically in any part of the country, and as a result the small household manufacturer, who makes some small article in his own home with the help of his family, will have a small electric motor to turn his machine. The silk filatures and spinning mills use hundreds of these motors. In fact, its use is almost unlimited at the present time.

The British concern in Kobe which is making inquiry for these motors is importing them from St. Louis in the United States. The ¼-h.p. model costs approximately 65 yen landed in Japan, while the ⅛-h.p. costs about 40 yen landed. This will give Canadian manufacturers some idea of the competition they must meet, but it is earnestly requested that Canadian manufacturers will make a bid for this business.

Further information and the address of the firm requiring these motors may be had on application to the Department of Trade and Commerce, quoting file No. T.C.-2-110.

Pig Iron Market

Pittsburgh reports the new price named by both the independent steel companies and the Carnegie Steel Co. has not served to attract buyers. It is understood, however, to have brought some specifications to the Carnegie Steel Co. on old orders. Makers of refined iron bars report no improvement and most plants are idle. One stack which has been banked for several weeks will be going into blast May 1.

Current business is confined to carloads and the lowest producer's price quoted is $24 local furnace for No. 2 foundry on the Chicago market.

Sales on the New York market during the past week amounted to 9,000 to 10,000 tons placed by cast-iron pipe and other buyers. Prices show a wide range. The lowest are considered to be $24 furnace on No. 2 foundry, $25 on No. 2X and $26 on No. 1 foundry, but in some cases several dollars higher have been paid.

The United Alloy Steel Corporation, Canton, are inquiring for 10,000 tons of basic iron for May delivery, but has not yet definitely decided whether it will buy this iron or blow in its furnace.

The Boston pig iron market is practically at a standstill, with but few sales and no new specific inquiries developing.

The establishment of a market is impossible, and quotations are not available that would bear any relation to an actual transaction, owing to a complete absence of any demand at St. Louis.

At Birmingham the middle of the month found the $25 base for Birmingham iron remaining only for car lots.

With the exception of a Columbus, Ohio, melter, who is in the market for 1,000 tons of basic and 100 tons of low phosphorus, delivery to extend over the next five months, inquiry is limited to one and two carload lots in the Cincinnati district.

On the Philadelphia market there has been a slightly increasing demand during the past week. A number of sales ranging from a carload to a few hundred tons have been made.

Scrap Metal

There has been practically no change in general conditions on the Pittsburgh market, except that between the fact that producers are not pressing much material for sale and expectations of a fuller operation of steel plants as a result of the price stabilization, the market has a somewhat steadier undertone.

The market at Chicago has taken a firmer tone, as dealers are looking forward to better trade. Several hundred tons of heavy melting steel were bought at from $11.25 to $11.50 per gross ton.

Several railroads have withdrawn their lists in the New York district, owing to the lowness of the prices bid for scrap. There is a scarcity of No. 1 machinery cast, steel car axles, shafting, stove plate and pipe, though the other grades have accumulated freely because of the few sales to plants.

Cleveland reports a little better feeling in the scrap market, which is attributed to the establishment of new prices by the Steel Corporation. There were very few transactions during the week.

Prices on borings, turnings, locomotive tires and car wheels are 50c lower, and iron axles have been bought at $3 below previous quotations on the Cincinnati market.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$25 00
Lake Superior, charcoal, Chicago	40 50
Standard low phos., Philadelphia	41 50
Bessemer, Pittsburgh	28 96
Basic, Valley furnace	26 00
Toronto price:—	
Silicon, 2.25% to 2.75%	34 10

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 25
Steel bars, base, Toronto	4 25
Iron bars, base, Montreal	4 25
Steel bars, base, Montreal	4 25
Reinforcing bars, base	4 25
Steel hoops	5 50
Tire steel	5 00
Spring steel	8 00
Band steel, No. 10 gauge and 3-16 in. base	4 75
Chequered floor plate 3-16 and heavier	6 50
Bessemer rails, heavy, at mill	2 35
Steel bars, Pittsburgh	2 10
Tank plates, Pittsburgh	2 20
Structural shapes, Pittsburgh	2 20
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 48
Structural shapes	3 58
Plates	3 78
Small shapes under 3-in.	3 48

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points	C.L.	L.C.L.
Montreal	58½	73
St. John, N.B.	84½	106½
Halifax	86	108
Toronto	38	54
Guelph	38	54
London	38	54
Windsor	35	50½

Current surcharge, 8 per cent.

METALS

	Gross. Montreal	Toronto
Lake copper	$18 00	$17 50
Electric copper	17 50	17 50
Castings, copper	17 25	18 00
Tin	36 00	39 00
Spelter	7 75	7 50
Lead	6 50	7 50
Antimony	8 00	8 25
Aluminum	34 50	30 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$5 00	$4 75
Plates, ¼ up	4 50	4 25

PIPE—WROUGHT

Standard Buttweld Pipe S/C

Per 100 feet.

Size	Steel Blk.	Steel Galv.	Gen. Wrot Iron Blk.	Gen. Wrot Iron Galv.
⅛ in.	$ 6 50	$ 8 50	$	$ ....
¼ in.	4 89	6 99	5 91	8 01
⅜ in.	4 89	6 99	5 91	8 01
½ in.	6 50	8 03	7 95	9 48
¾ in.	7 99	10 06	9 95	12 02
1 in.	11 82	14 88	14 71	17 77
1¼ in.	15 99	20 13	19 90	24 04
1½ in.	19 11	24 06	23 79	28 74
2 in.	25 72	32 38	32 01	38 67
2½ in.	40 66	51 19	.....	.....
3 in.	53 17	66 94	.....	.....
3½ in.	67 62	84 18	.....	.....
4 in.	80 12	99 74	.....	.....

Standard Lapweld Pipe S/C

Per 100 feet.

Size	Steel Blk.	Steel Galv.	Gen. Wrot Iron Blk.	Gen. Wrot Iron Galv.
2 in.	$29 42	$36 08	$35 71	$42 37
2½ in.	44 17	54 70	54 11	64 64
3 in.	57 76	71 53	70 76	84 53
3½ in.	69 46	86 02	85 10	101 66
4 in.	82 30	101 92	100 83	120 45
4½ in.	95 89	1 20	1 30	1 54
5 in.	1 12	1 40	1 52	1 80
6 in.	1 45	1 81	1 97	2 33
7 in.	1 89	2 37	2 53	3 01
8L in.	1 99	2 49	2 66	3 16
8 in.	2 29	2 87	3 07	3 64
9 in.	2 74	3 43	3 67	4 36
10L in.	2 54	3 18	3 41	4 05
10 in.	3 28	4 10	4 39	5 21

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4-in. and under, 50 per cent.

4½-in. and larger, 40 per cent.

4-in. and under, running thread, 20%.

Standard couplings, 4-in. and under, 20%

Dd., 4½-in. and larger, net.

OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

	Montreal	Toronto
Copper, light	$ 8 50	$ 9 00
Copper, crucible	11 00	11 00
Copper, heavy	10 50	11 00
Copper wire	11 00	11 00
No. 1 machine composition	9 50	9 75
New brass cuttings	7 00	8 00
Red brass turnings	7 50	8 00
Yellow brass turnings	5 00	6 00
Light brass	3 50	5 00
Medium brass	5 50	6 00
Scrap zinc	4 00	4 00
Heavy lead	3 50	4 00
Tea lead	2 00	2 00
Aluminum	12 00	10 00

	Per Ton	Gross
Boiler plate	$10 00	$12 00
Heavy melting steel	9 00	14 00
Axles (wrought iron)	22 00	20 00
Rails (scrap)	12 00	14 00
Malleable scrap	12 00	20 00
No. 1 machine cast iron	22 50	25 00
Pipe, wrought	8 50	8 00
Car wheel	25 00	25 00
Steel axles	18 00	18 00
Mach. shop turnings	5 00	6 00
Stove plate	20 00	20 00
Cast boring	3 00	7 00

BOLTS, NUTS AND SCREWS

	Per Cent.
Carriage bolts, 7-16 and up	Net list
Carriage bolts, ⅜" and less	15
Coach and lag screws	—20
Stove bolts	55
Wrought washers	—25
Elevator bolts	Net
Machine bolts, 7-16 and over	—5
Machine bolts, ⅜-in. and less	—30
Blank bolts	Net
Bolt ends	—5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	Net
Machine screws, o. and fil. hd., brass	Net
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 25
Nuts, hex., tapped	add 2 75
Copper rivets and burrs, list less	27½
Burrs only, list plus	10
Iron rivets and burrs	37½ and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	67½
Wood screws, flat, bright	67½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	Less 40%
Square and hexagon head cap screws	Less 30%
Round head cap screws	Plus 10%
Fillister head cap screws	Less 10%
Flat head cap screws	Net list
Button head cap screws	Plus 10%
Studs	Less 20%
Semi-finished nuts up to and including 1-in.	Less 35%
Semi-finished nuts 1⅛ to 1½"	Less 30%
Semi-finished nuts 1⅝ to 2 in.	Net list
Coupling bolts	Plus 10%
Taper pins	Less 40%
Planer bolts without fillet	Plus 40%
Planer bolts with fillet	Pus 50%
Patch bolts	Plus 80%
Hollow set screws	Plus 20%
Thumb screws	Less 35%
Thumb nuts	Less 65%

BILLETS

F.O.B. Pittsburgh.

	Per gross ton
Bessemer billets	$43 50
Open-hearth billets	43 50
O.H. sheet bars	39 00
Forging billets	48 50
Wire rods	48 00

NAILS AND SPIKES

Wire nails, base	$4 55
Cut nails, base	5 10
Miscellaneous wire nails	50%

ROPE AND PACKING

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 26
British Manila rope	0 20
New Zealand hemp	0 20

POLISHED DRILL ROD

Discount off list, Montreal and Toronto	Net

LeBLOND
HEAVY DUTY
Universal Millers

Are not only Tool Room Machines, but as a manufacturing proposition appeal to the careful buyer.

Their long life insures ample returns for the investment made.

May we explain to you their many advantages and the convenience of their control?

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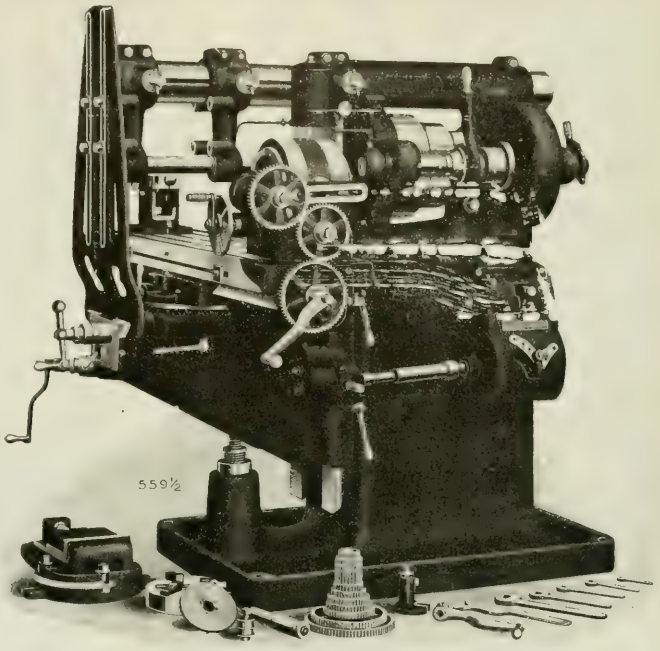


The Week's Events in Montreal Industry

The successful contestant this year for the gold-headed cane annually presented by the Montreal Harbor Commissioners to the captain of an ocean liner first bringing his ship to the port goes to Captain Michael Doyle, of the Cunard freighter Venusia, which arrived last Thursday night from London.

* * *

At the organization meeting of the Corporation of Professional Engineers of Quebec, held at the headquarters of the Engineering Institute of Canada, A. R. Decary was elected president. Adhemar Mailhiot has been re-engaged as registrar and offices have been opened in the Dandurand Building, where all communications will be addressed. The object of the new organization is to bring together engineers from all parts of the Dominion and assist in the ethics of the profession. It is also the intention to so organize the profession through the Dominion that in time a Dominion registration may be provided, thus enabling engineers to practise in any province.

* * *

At a meeting held last Thursday under the auspices of the Canadian Workers' Federation of Returned Soldiers and Sailors, the Hon. C. C. Ballantyne was the speaker of the evening, during the course of which he was presented with a gold membership badge of the Federation. During the course of his remarks Mr. Ballantyne stated that tenders would soon be asked by the Government for the construction of an ice breaker, and expressed the hope that the workers present would co-operate with the shipyards here so that they would be in a position to quote with some prospect of securing the contract for a Montreal firm.

* * *

At the last meeting of the Montreal section of the Engineering Institute of Canada, an address was given by G. E. Newill, the general manager of the Robb Engineering Works, of Amherst, N.S., on the development of turbine construction, and in particular, on the achievement of the Dominion Bridge Co., of Lachine, in building a turbine power installation for the British-American Nickel Co. at Sudbury. It will be interesting to know that this is the first time that an engineering firm in Canada has accepted the challenge to construct a large power turbine of this character, running as it did in about a quarter of a million dollars and requiring all the precision of mechanical discernment and nicety that might be needed in the making of a full jeweled watch to be propelled by steam.

STEEL OF CANADA BOARD RE-ELECTED

Hamilton.—At the eleventh annual meeting of the Steel Company of Canada, it was reported that the company had made profits of $3,924,041.50 during the year, which was considered very satisfactory. This amount remained after deduction was made for repairs, maintenance, improvements and provisions made for inventory reserve and income tax payments.

The following officers were elected:

Directors—Cyrus A. Birge, A. J. Brown, J. H. Duggan, Lloyd Harris, Robert Hobson, Ross H. McMaster, Hon. John Milne, F. G. Osler, Sir Thomas White, K.C.M.G.; Hon. Smeaton White, Charles S. Wilcox.

Executive officers: Charles S. Wilcox, chairman of the board; Robert Hobson, president; Ross H. McMaster, vice-president; H. H. Champ, secretary and treasurer; H. S. Alexander, assistant treasurer; Corbett F. Whitton, assistant secretary.

MISCELLANEOUS

Solder, strictly	$ 0 25
Solder, guaranteed	0 27
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	17 00
Red dry lead, 100-lb. kegs, per cwt.	13 00
Linseed oil, boiled, single bbls.	1 03
Wood alcohol, per gal.	2 75
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire size	40 and 5
Can. carbon cutters, plus	10
Standard drills, all sizes	40 and 5
3-fluted drills, plus	10
Jobbers' and letter sizes	40 and 5
Bit stock	**50**
Ratchet drills	10
Pure turp., single bbls., gal.	1 20
Linseed oil, raw, single bbls.	1 00
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	Net
Bridge reamers, carbon	50
Centre reamers	5
Gasoline, per gal., bulk	0 42
Chucking reamers	Net
Hand reamers	10
High speed drills, list net to plus	20
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At Warehouse]

Rounds and squares	$7.00 base
Hexagons and flats	7.00 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	26	36
Class C	17	26

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 6 00	$ 6 50
Sheets, blue ann., No. 10	5 25	5 50
Canada plates, dull, 52 sheets	7 50	13 00
Can. plates, all bright	14 00	.....
Apollo brand, 10¾ oz., galvanized	.....	.....
Queen's Head, 28 B.W.G.	10 75	.....
Fleur-de-Lis, 28 B.W.G.	10 00	.....
Gorbal's Best, No. 28	.....	.....
Colborne Crown, No. 28	.....	.....
Premier, No. 28, U.S.	8 25	8 50
Premier, 10¾-oz.	8 25	8 90
Zinc sheets	13 00	15 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent.
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClennand, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES

Size	Seamless	Lapweld
1 in.	$26 00	$
1¼ in.	27 25	.....
1½ in.	26 25	29 50
1¾ in.	29 75	27 00
2 in.	29 25	24 50
2¼ in.	33 00	28 50
2½ in.	44 75	32 50
3 in.	49 25	40 00
3¼ in.	.....	48 50
3½ in.	63 50	43 50
4 in.	85 00	55 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS

Castor oil, per lb.	—
Royalite, per gal., bulk	28
Palacine	31
Machine oil, per gal.	58
Black oil, per gal.	27
Cylinder oil, Capital	1.01
Petroleum fuel oil, bbls., net	11.2

BELTING—No. 1 OAK TANNED

Extra heavy, single and double	15%
Standard	15 and 10%
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 50
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	8¾
Pumice, ground	06
Emery glue	30
Tripoli composition	9½
Crocus composition	12
Emery composition	11
Rouge, silver	64
Rouge, powder, nickel	38

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	8½
Grits, 80 and finer	6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	30
Brass sheets, 24 gauge and heavier, base	38
Brass tubing, seamless	42
Copper tubing, seamless	44

XXX Extra	.21
Peerless	.22
Grand	.21½
Superior	.21½
X L C R	.16½
Atlas	.19
X Empire	.15
Ideal	.18
X Press	.13½

WASTE

Colored

Lion	.13½
Standard	.12
No. 1	.14
Popular	.10½
Keen	9

Wool Packing

Arrow	.35
Axle	.28
Anvil	.22
Anchor	.17

Washed Wipers

Select White	.20
Mixed colored	.10
Dark colored	.09

This list subject to trade discount for quantity.

RUBBER BELTING

Standard	10%
Best grades	15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$30 00	$34 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	32 00	38 00
Copper sheet, tinned, 14 x 60, 14 oz.	38 00	42 00
Copper sheet, planished, 16 oz. base	44 00	48 00
Braziers', in sheets, 6 x 4 base	36 00	41 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$ 9 50	$14 50
Sheets, 3½ lbs. sq. ft.	9 25	14 00
Sheets, 4 to 6 lbs. sq. ft.	9 00	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, hydrochloric	.03¾
Acid, nitric	.10¼
Acid, sulphuric	.03¾
Ammonia, aqua	.20
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.18
Copper, carbonate, annhy.	.35
Copper, sulphate	.10
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	16½
Nickel carbonate	.30
Nickel sulphate	.17½
Potassium sulphide (substitute)	.40
Silver Chloride (per oz.)	1.15
Silver nitrate (per oz.)	1.10
Sodium bisulphate	.13
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.39
Sodium hyposulphite per 100 lb.	6.50
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated

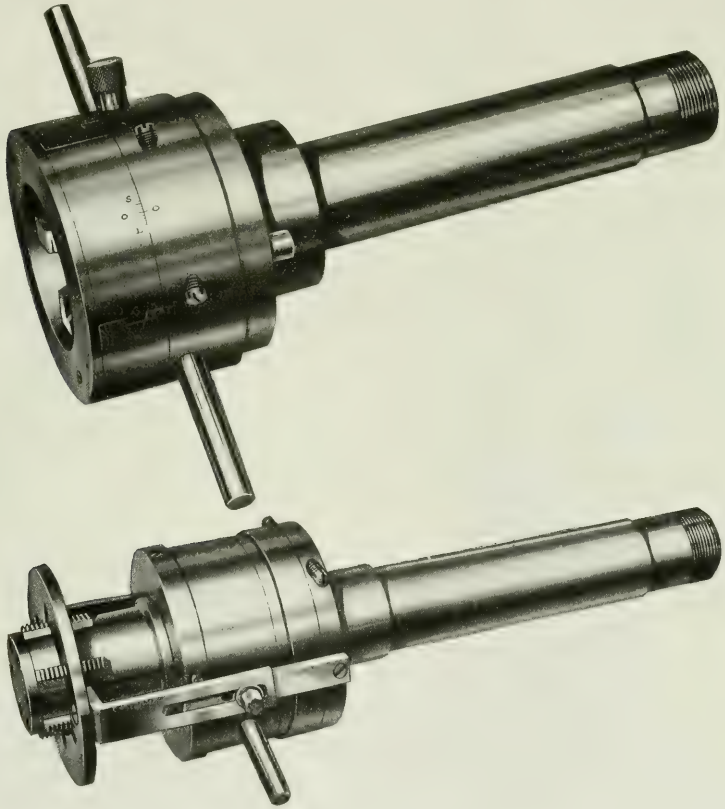
GEOMETRICS

For Cutting Screw Threads

MET GEO RIC

Right on the Lead

Self-Opening and Adjustable Die Heads and Collapsing Taps made in many styles for the many makes of Machines employed in producing Screw Theads.



Geometric Die Heads and Collapsing Taps are furnished with specially threaded shanks to fit them for use in the special threading fixture provided on the Gridley Single Spindle Automatics. Whatever make of machine, there is a Geometric to fit it.

THE GEOMETRIC TOOL COMPANY
NEW HAVEN CONNECTICUT

Canadian Agents:

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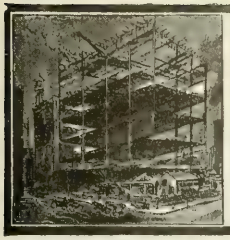


INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES

MONTHS YET BEFORE LOW STEEL PRICES WILL BE OF ASSISTANCE

ALTHOUGH a new schedule has been announced in steel prices, it will be some months yet before a number of the large users can take advantage of the new prices.

The agricultural implement makers, for instance, make their purchases months in advance. It is necessary to do this in order that they may be sure of supplies coming along regularly in conformity with their manufacturing schedule.

Speaking of these conditions, J. N. Shenstone, of the Massey-Harris Co., said, "It will probably be well on in 1922 before we shall be able to take advantage of cheaper steel. It is impossible for a lower price to have an immediate effect on our business. Right now the sheds and warehouses around here are full of machines that have been made at a high price, and we have a lot of material that has yet to be worked up. In this way it will be some months yet before the lower priced material starts to make its way into our shops."

Mr. Gifford, works manager of the Toronto plant, left at the first of the week for South Africa, where a shipment of machinery has been sent.

The Russian situation is being watched with interest from the London office of the firm. A number of different proposals have been put forward to sell machinery to Russia, some of them carrying with them proposals to pay for the same in oil and leather. There is nothing yet to indicate that the Russian people are in any state to trade with on a safe and profitable basis, and the Massey-Harris Co. have made no move to re-open their business in that country.

WANT BUSINESS FROM THESE FIRMS

People Abroad Who Want to Sell Goods if Canadians Can Supply Them

Firms wishing to secure information about any of the following should apply to this paper, mentioning the number in each case:

2921. **Engineering and structural materials.**—A responsible Canadian firm of contractors and consulting engineers established in London who are interested in public works contracts in certain British colonies invite Canadian manufacturers of engineering and structural materials wishing to obtain export business to submit to them full particulars to practise in any province.

2925. **Electrical material.**—A Milanese house wishes to buy electrical material in Canada.

2934. **Electrical supplies.**—A dealer at Zagreb, Yugoslavia, would be glad to hear from Canadian exporters of textile and other lines suitable for the Yugoslav market.

2937. **Hardware and metals.**—A firm in Belgrade, Yugoslavia, would be interested to receive particulars from Canadian exporters of hardware, iron and steel and other metal lines and agricultural implements.

Goodyear Changes.—Control and management of the Goodyear Tire & Rubber Co. will pass from F. A. Seiberling, now president and general manager, to an investment bankers' committee as the result of plans for refinancing definitely announced. The committee representing the bankers will control the management of the company for a maximum period of twenty years, this being the maturity of an issue of $30,000,000 Goodyear first mortgage twenty-year 8 per cent. sinking fund gold bonds which will be offered for public subscription.

Conditions Better.—There are signs of a revival of business among the factories of St. Catharines. Some of them, notably McKinnon's, are taking on new men daily, and have several hundred men at work. The big plant was practically shut down this winter, but has now a rush of orders, and may have to put on a double shift for a time. The Consolidated Rubber Co. has lately spent a large amount of money on its engine house at Port Dalhousie, which seems to indicate that the present shutdown will not be for very long.

Formed New Connection.—D. J. Beatty, formerly advertising manager for the Northern Electric Co., has resigned to go into partnership with G. L. MacGillivray in the G. L. MacGillivray & Co., Ltd., 103 Notre Dame Street West, Montreal. This company was recently formed to look after the selling interests of the following firms in Eastern Canada: Edwards & Co., Inc., American Insulator Corporation, Waterbury Manufacturing Co., Chase Metal Works, Parker Supply Co., Inc., R. M. Radio Co. of London, Eng., the Prometheus Electric Co. For some time prior to enlisting for overseas service, Mr. Gordon MacGillivray was assistant supply sales manager for the Northern Electric Co. at Montreal.

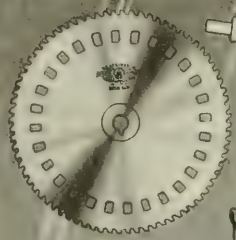
Engineer for Sarnia.—It is likely that the selection of a city engineer for Sarnia will be made shortly. It is understood that from among forty applicants, who represent the entire Dominion from Halifax to Vancouver, the choice has narrowed down to two, who will be brought there for personal interviews with the council.

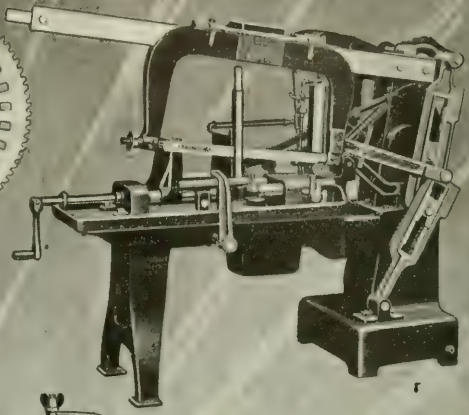
Change in Name.—In connection with the formation of the Hamilton Car Co., Ltd., the following announcement is made: The National Steel Car Corporation, Ltd., of Hamilton, Ont., took over the plants and effects of the National Steel Car Co., Ltd., as a going concern, and is now operating the business under the title of the National Steel Car Corporation, Ltd. To prevent confusion on account of the similarity of names, the National Steel Car Co., Ltd., has changed its corporate name to that of the Hamilton Car Co., Ltd. The Hamilton Car Co., Ltd., owns certain stock and effects pending final liquidation, but is not in the business of building railway car equipment.

Important Steps.—According to reports to the Canada Research Council from the Associate Committee of Mining and Metallurgy it is now regarded as highly probable that the vast deposits of low-grade magnetic iron ore can be successfully smelted in Canada on a commercial scale. The Lignite Utilization Board reported that it has now every reason to believe that in the near future it will be successful in producing on a commercial scale from the low-grade lignites of Western Canada briquettes equal and in some respects superior to anthracite coal.

C. Rehden & Son, Bowmanville, are preparing plans for foundry to cost $60,000.

ATKINS STERLING QUALITY SAWS





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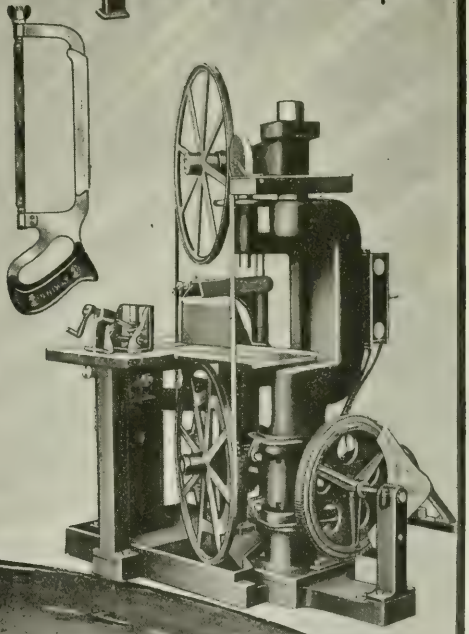

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What you pay for a few ordinary drinking cups will meet the cost of the

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(MADE IN CANADA)

DRINKING CUPS ARE UNSANITARY but the "Puro" delivers clean, fresh water at a reduction of 15 per cent. to 35 per cent. in water bill. "PURO" WILL SAFEGUARD THE HEALTH OF YOUR EMPLOYEES and protect your staff against disorganization by sickness.
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BERTRAMS LIMITED
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Scrap Yard To Be The First to Reflect Turn of the Market

An improvement in the market conditions, or in business generally, must be preceded by an improvement in the scrap metal trade. That is the statement of one of the best informed men in the business.

"It has been so in many past experiences and it will be true again in the present case. Iron and steel will show no improvement until there is a betterment in the scrap of these lines and the same can be said of copper. There will be no movement in goods that copper goes into—and they are numerous—until there is a stiffening of prices in the scrap market.

"It is true," our informant concluded, "that coming events cast their shadows before, and in this case the shadows must first fall on the scrap yards. Watch and see."

BIG INCREASE IN POWER COSTS

How These Charges Have Been Increased During the Last Few Years

Cost of power occupied the time of Paul M. Lincoln, the noted American electrical engineer, in his address to the Electrical Engineering Institute at the Physics Building of the University of Toronto.

Mr. Lincoln dealt largely with fixed charges and operation ratio of electrical plants throughout North America. He showed that the price of every raw material had increased tremendously since before the war, and that this made an enormous difference in the price of operation of electrical plants then and now.

A Steady Increase

The actual operation cost dropped from 1910 to 1914, the average drop running about 5 per cent., but since 1915 there has been a rapid and steady increase in power house costs.

Mr. Lincoln estimated that the cost of a power plant to-day would run to 225 per cent. more than it did in pre-war times. This means that the public must pay, in the same ratio, these increased charges.

In plants which are operated by coal power, Mr. Lincoln showed that the coal costs during the past few years had considerably enhanced the cost of power. Further, he stated that the cost of labor in operation of power plants might be taken at 85 per cent. in excess of what it was in 1914. In total, he fixed the ratio of expenses in power operation from 1914 to 1920 as approximately 2½ to 1.

A Slight Mistake

"Oh," exclaimed the fair boarder, as a couple of calves scampered across the meadow, "what pretty little caflets!"

"Yew air mistaken, ma'am," said the old farmer. "Them's bullets."

MECHANICAL YEAR BOOK

The 1921 edition of the Mechanical World Year Book, published by Emmott & Co., Ltd., 65 King St., Manchester, England, is well worth a place in any bookcase, desk or toolbox. To go over the details in brief space is impossible, but here are a few of the subjects covered: Steam and steam engine, constructional details of same, notes on condensing plant, notes on steam turbines, steam boilers, boiler construction, riveted joints, safety valves, boiler mounting and setting, boiler chimneys, notes on superheating, gas engines, oil engines, Diesel engines, suction gas producers, properties of metals and alloys, structural iron and steel work, beams and girders, strength of materials, shafting, keyways, and gearing.

Following this are the subjects of gear cutting, milling machine practice, notes on grinding, limit gauges, standards of limits, verniers and micrometers, Morse taper shanks, ball and roller bearings, notes on belting, rope driving, chain gearing, friction and lubrication, water and hydraulic work, hydraulic data, steam heating, notes on screw cutting and miscellaneous tables of considerable use to mechanics in general. The English price of this book is 2s. 6d., and the Canadian price, including postage, would be between 75 cents and a dollar.

The Joseph Stokes Rubber Co., Welland, Ont., whose plant was built last fall, have completed the installation of machinery and intend to start on quantity production within a few days.

Dissipated Wretch!

A small, hen-pecked, worried-looking man was about to take an examination for life insurance.

"You don't dissipate, do you?" asked the physician, as he made ready for the tests. "Not a fast liver or anything of that sort?"

The little man hesitated a moment, looked a bit frightened, then replied in a small piping voice: "I sometimes chew a little gum."

TRADE GOSSIP

The Gove Motor Car Co., Detroit, Mich., contemplates the construction of a factory.

The erection of a three-story garage is planned by Patrick Labell, 721 Dorchester Street, Montreal.

An addition will be erected to the cement plant of the Middleton Cement Products Co., Middleton, N.S.

An addition will be erected to garage at cost of $15,000 by J. Van Sickler, 374 Dupont Street, Toronto, Ont.

The Glem Motors, Ltd., has been incorporated with head office at Toronto and capital stock of $1,000,000.

Smart's Brockville Furnaces, Ltd., is capitalized with capital stock of $100,000 and head office at Brockville, Ont.

The Abrams West Columbia Oil Co., Ltd., has been incorporated with capital of $1,000,000 and head office at Toronto.

The Canada Iron Foundries, Fort William, are contemplating the erection of addition to foundry at a cost of $150,000.

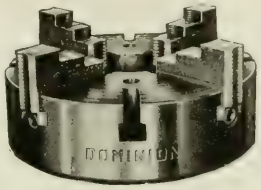
The West Gas Improvement Co., Manchester, England, has been awarded the contract for the construction of carbonizing plant costing $125,000 for the Victoria Gas Co., Victoria, B.C.

Permit has been granted to the British Canadian Oil Co. for the erection of a motor service station at the southeast corner of Bloor and Shaw Streets, Toronto.

Nearing Completion.—The Carbon and Alloy Steel Co., who are installing an electrical steel mill at Fraser, Ont., near Niagara Falls, have progressed with their plant to a point where the electrical equipment is now being placed in position. The mill, which will specialize in carbon and tool steels, should be in operation within the next six weeks.

New Plant Starts.—The electric steel foundry of the J. W. Cumming Mfg. Co., New Glasgow, N.S., is now in operation, under the direction of J. M. Robertson, Montreal, the designing engineer of the plant, and C. A. Pascoe, metallurgist, and Sanford Davis, electrical engineer, of Montreal.

Purchasing Agents to Meet.—The second annual convention of the Purchasing Agents' Association of Canada will be held in Toronto on May 14th at the King Edward Hotel. Every purchasing agent, whether a member or not of any of the associations now formed, is cordially invited to attend. Matters vital to every industrial company and purchasing agent will be discussed.



DOMINION CHUCKS

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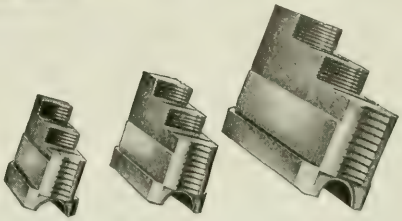
BUILT FOR HEAVY DUTY



The Jaws Are Extra Strong

THEY are drop forgings, made of best quality steel, heat-treated and hardened. The threaded portion of jaws form a half nut for the setting-up screws. Have stood the test of heavy duty work in our own shops where accuracy was the only accepted standard.

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Oil Tempered Steel Springs

—for every purpose and the best for each use.

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Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.

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SAY YOU SAW IT IN CANADIAN MACHINERY

SAVING GAGES THAT WERE USED IN THE TURNING OUT OF WAR MUNITIONS

Working quietly in Washington since shortly after the armistice, John O. Johnson, head of the gage section of the War Department, has been engaged in the task of gathering together and storing away in places where they can be found when needed all the gages used in the manufacture of arms and ammunition in plants of all descriptions throughout the country. Until recently Mr. Johnson had the rank of major, but was honorably discharged. He continues, however, as head of the gage section, which was created after the war.

It is estimated that the value of the gages is approximately $30,000,000. The collection and preservation of these instruments is a step forward in carrying out a general policy which has for its object the maintenance by the War Department at all times of the necessary minor attachments, such as dies, jigs, special tools, etc., by which machinery used in commercial manufacture may be changed almost over night for making parts of arms and ammunition.

Since the gage section was created Mr. Johnson has been at work supervising the collection into the various Government arsenals of all gages and special tools which were used by private plants in the manufacture of arms and ammunition. Considerable progress has been made in this undertaking and in cataloging and filing of these instruments.

The policy of "manufacturing preparedness" is the result of the efforts of Representative John Q. Tilson of Connecticut, who has been urging the plan upon the War Department since 1913 and made frequent appeals for it as a member of the House Committee on Military Affairs before the United States entered the war. His efforts have been partly successful, as is indicated by the work being supervised by Mr. Johnson. It is expected that his plan will be put into complete operation. It already has been submitted to President Harding, and Representative Tilson will confer with Secretary of War Weeks soon with reference to the program.

Mr. Johnson, who comes from New Haven, Conn., formerly was associated with the Winchester Repeating Arms Co. Shortly after the outbreak of the European War, he was employed by the Imperial Munitions Board of Canada to supervise the placing of contracts in the United States for the manufacture of gages for the Canadian government. Being an expert on gage manufacture, he was invited, upon the entrance of the United States in the war, by the ordnance bureau of the War Department, to accept a commission in that corps. He gave up his work with the Canadian government and accepted a commission as captain of ordnance of the United States Army, being promoted subsequently to the rank of major.

In an article recently contributed to the Army Ordnance Journal, Mr. Johnson says that he expects to complete the work of conserving the gages by June 21. The net result will be that the Ordnance Department, through the gage section, will be able to tell at any time just what gages are on hand, the condition of each gage and its exact location. "In case of emergency, where quick expansion would be imperative, complete sets of gages on each component could be selected and distributed so that every contractor would receive his immediate needs, which would hold him over until more gages could be made. By this method the contractor would be ready to begin work as soon as his machines and equipment were arranged, and would save considerable time in getting into quantity production."

HAVE CUT PRICE OF IMPLEMENTS

How Old Country Iron and Steel Trade Is Trying To Get Buyers To Take Hold

Manchester.—In an endeavor to stimulate demand, and in a measure to meet competition emanating from certain foreign countries, reductions in many lines of iron and steel manufactures have recently taken place. Northampton forge is now selling at £8 at the furnaces, and foundry iron at £8 15s. per ton. Staffordshire unmarked bars have fallen £2 per ton, the present selling price being £24 10s. The Lancashire price is £22 per ton.

Owing to keen competition from Belgium, nut and bolt iron has fallen to £22 per ton. Gas strip records a reduction of £1 per ton, the price now being £26.

A fall of £3 per ton on steel strips and hoops has brought the ruling price to £20. Steel prices are steadily falling. Belgian billets are offered in the midland counties of England at £9 per ton.

A further decline in the values of black and galvanized sheets took place last week, which left the prices at £20 and £24 10s. per ton respectively.

In the Cleveland iron district the general slump in trade has been keenly felt, with the result that the ironmasters have decided to cut prices. Further, the influx of Belgian (and probably German) pig-iron, which is considerably cheaper than the Cleveland product, has had a deterrent effect on the sales of the latter district. A fall of 75s. per ton since the end of last year is recorded in connection with Cleveland pig-iron. No. 1 is now £7 15s.; No. 3 G.M.B., £7 10s.; No. 4 foundry, £7 9s.; No. 4 forge, £7 7s. 6d.; mottled, £7 7s. 6d.; and white iron, £7 5s. —all for domestic consumption. For export an additional 5s. per ton is added. Belgian pig-iron is said to be offered at £7 per ton delivered.

The drop in hematite values has brought No. 1 down to £9 2s. 6d., and mixed numbers down to £9 per ton.

GERMANS CAN SELL TOOLS CHEAPER THAN THE BRITISH CAN MAKE THEM

The Department of Overseas Trade, through the Toronto office, sends the following information exclusively to Canadian Machinery:

At the annual meeting of the Machine Tool Trades Association a proposition was put to the meeting that the members should refrain from dealing in German machinery. This resolution was defeated by a large majority, a fact which has caused a good deal of comment, and a certain amount of misunderstanding. The following statement may serve to make the position clear.

In the first place it was seen that the resolution would be ineffective in securing the desired object. There are firms outside the association who would, it was felt, immediately take advantage of such an action to obtain trading agreements with German firms, and it would thus result that firms factoring United Kingdom machine tools would not be able to do the full amount of business in British goods otherwise possible, since buyers naturally prefer to give their business to firms offering the widest range of goods. Secondly, some firms are avowed opponents of protective measures, whether by state action or by resolution, and these opposed the measure on general grounds. The latter is not, however, a general attitude. At present most firms cannot meet the position created by the rate of exchange, by which German goods can be sold at a price less than the cost of the materials in the United Kingdom, and many feel that if the exchange position were rectified the United Kingdom manufacturer would, by efficient production, defy competition. These firms are in favor of some measure of protection which would remove the disadvantage caused by the low rate of exchange, at any rate for the home market.

It may be of interest to observe in connection with this and other industries, that a measure is being introduced into parliament intended to deal with the situation in the home market caused by the low rate of exchange of continental currencies.

Machinery Stock List

In Stock at Toronto

TURRET LATHES

1—Gisholt "H," 21", Standard Turret Lathe, complete.

ENGINE LATHES

1—McDougall 26" x 14', D.B.G. and Q.C.G. Engine Lathe.
1—20" x 10' Walcott, D.B.G. and Q.C.G. Engine Lathe.
2—26" x 12' Walcott, D.B.G. and Q.C.G. Engine Lathes.
1—20" x 8' Walcott, D.B.G. and Q.C.G. Engine Lathe.
1—18" x 8' Walcott, D.B.G. and Q.C.G. Engine Lathe.
1—14" x 6' Walcott, D.B.G. and Q.C.G. Engine Lathe, with taper attachment.
1—Reed-Prentice 14" x 6' Toolroom Lathe, Q.C.G., Gear Box taper attachment, draw-in chuck, one collet and regular equipment.
1—Reed-Prentice 14" x 6' Toolroom Lathe, Q.C.G., taper attachment, compound rest relieving attachment, draw-in chuck, and one ½" collet and oil pan.
1—Seneca Falls 12" x 6' Toolroom Lathe, Q.C.G., Taper Relieving and draw-in attachments and pan bed.
1—Seneca Falls 12" x 6' Toolroom Lathe, Q.C.G. and pan bed.
1—Seneca Falls 12" x 6' Toolroom Lathe, Q.C.G. and standard equipment.
1—Seneca Falls 11" x 6', Quick Change Gear Lathe.
1—Seneca Falls 9" x 4', Plain Engine Lathe.

SCREW MACHINES

2—No. 2 Brown & Sharpe Automatic Screw Machines.
1—No. 0 Brown & Sharpe Automatic Screw Machine.
1—Warner & Swasey (used) No. 4 Hand Screw Machine, pan bed, friction head, without power feed to turret.
3—Foster No. 4 Hand Screw Machines (used), with friction head, pan bed, without power feed to turret.

MILLING MACHINES

2—Brown & Sharpe No. 1 Universal Milling Machines.
2—Brown & Sharpe No. 2 Universal Milling Machines.
1—Brown & Sharpe No. 2A Universal Milling Machine.
1—Ford-Smith No. 2 Universal Milling Machine.
1—Ford-Smith No. 3 Universal Milling Machine.

BOLT THREADING MACHINES AND ACCESSORIES

1—Landis 1" Double Head Bolt Threading Machine with leadscrew attachments.
1—Landis 1½" Single Head Bolt Threading Machine.
1—Landis 2" Single Head Bolt Threading Machine.
3—Landis ½" Rotary All Steel Bolt Die Heads.
3—Landis 1" Rotary All Steel Bolt Die Heads.
3—Landis 1½" Rotary All Steel Bolt Die Heads.
2—Landis 2" Rotary All Steel Bolt Die Heads.
1—Landis 1¼" Automatic Die Head.

In Stock at Montreal

1—Gisholt 21" Std. Turret Lathe, 3½" Spindle, comp. with set boring and turning tools.
1—McDougall 26" x 14', D.B.G., Q.C.G. Engine Lathe.
1—McDougall 20" x 10', S.B.G., P.C.G. Engine Lathe.
1—Walcott 26" x 12', D.B.G., Q.C.G. Engine Lathe.
1—Walcott 20" x 10', D.B.G., Q.C.G., Engine Lathe.
1—Walcott 20" x 8', D.B.G., Q.C.G. Engine Lathe.
1—McDougall 18" x 8', D.B.G., Q.C.G. Engine Lathe.
2—Walcott 18" x 8', D.B.G., Q.C.G. Engine Lathes.
1—Walcott 18" x 8', D.B.G., Q.C.G. Engine Lathe, complete with pan bed and taper attachment.
1—Walcott 16" x 6', D.B.G., Q.C.G. Engine Lathe.
1—Walcott 14" x 6', D.B.G., Q.C.G. Engine Lathe.
1—Seneca Falls 12" x 6', Style E Tool Room Lathe, draw-in chuck, one collet, ¼" taper attachment.
1—Seneca Falls 12" x 6', Style E Tool Room Lathe.
1—Seneca Falls 12" x 6', Style H Tool Room Lathe, pan bed.
1—Seneca Falls 11" x 5', Style E Tool Room Lathe, draw-in chuck, one collet, ¼" taper attachment.
1—Seneca Falls 9" x 4', Tool Room Lathe with pedal attachment.

BALERS

1—Climax Hand Baler, No. 2, capacity bale 14 x 18 x 28.

BOLT MACHINES

1—No. 734 Wells Bolt Threading Machine with friction countershaft, cap. ¼ to 2".
1—Landis 1½" Single Head Threading Machine without chasers.
1—Landis 2" Single Head Threading Machine without chasers.
1—Landis 1½" Double Head Threading Machine without chasers.
2—Landis 1" Bolt Cutter Heads without chasers.
2—Landis 1½" Bolt Cutter Heads without chasers.
2—Landis 2" Bolt Cutter Heads without chasers.
1—1¼" Landis Automatic Screw Cutting Die Head without chasers.

We have in stock large assortment chasers (About 345 Sets)

DRILLING MACHINES

2—No. 3 McDougall 20", B.G., Power Feed Drills, cap. 1¼".
2—No. 14 Perfect Column Drills, cap. 9/16" drills.
1—5/16" McKenzie Column Drill.
1—No. 18 Perfect Bench Drill, cap. 5/16" drills.
1—No. 15 Perfect Bench Drill, cap. 9/16" drills.
1—5/16" McKenzie Bench Drill.
1—No. 1 10" Burke Sensitive Drill, cap. 0 to ⅜".
2—Buffalo 10" Bench Drills, 9/16" capacity.
2—No. 28 Canedy Otto Sensitive Bench Drills, 0 to ½".

RADBORE DRILLING ATTACHMENT

1—No. 5, Milling Machine Type.

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"Canada's Departmental House for Mechanical Goods"

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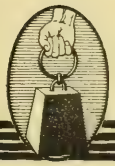

Classified Opportunities

FOR SALE

ELECTRIC STORAGE BATTERY LOCOMOtives for sale. Two. 36-inch gauge. Complete and in good condition. R. T. Gilman & Company, Dept. "E," 211 McGill Street, Montreal. (etfm)

FOR SALE ONE ALLIGATOR SHEAR, 7" blade. Capacity 1-½" round cold soft steel. Canadian Atlas Crucible Steel Co., Ltd., Welland, Ont. (c17m)

ONE 50 K.V.A., SINGLE PHASE OR 3 PHASE 60 cycle, A.C., 2300 volt, generator and exciter. Box 770, Canadian Machinery. (c17m)

ONE 2 PHASE, 60 CYCLE, 220 VOLT CROCKer-Wheeler preferred, 15 H.P.; one 2 phase, 60 cycle, 220 volt, Crocker-Wheeler preferred, 20 H.P.; both 1200 R.P.M., complete with base and standard pulley, starter with no voltage release. Box 771, Canadian Machinery. (c17m)

SIX 35-50 H.P., 300 R.P.M., 3 PHASE, 60 cycle, 550 volt; six approximately 20 H.P., 3 phase, 60 cycle, 550 volt motors. Box 772, Canadian Machinery. (c17m)

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We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

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Machine Shop Equipment
At Extremely Low Prices

LATHES—All sizes and lengths of bed. Special price quoted on rebuilt 20 in. x 8 ft. C.M.C.

AIR COMPRESSOR—8 in. x 8 in. Chicago Pneumatic.

TANKS—10 Tanks 10 ft. 6 in. diam. x 29 ft. 6 in. long. 19,000 gals.
3 Tanks, 10 ft. 0 in. diam. x 39 ft. 0 in. long, ⅜ in. Heads. 22,893 gals.
Full line of other Steel Storage Tanks, open and closed, all sizes.

PUMPS—1 Triplex Power Pump, 1½ in. x 6 in. Hydraulic Machy. Co. Also 1 in. x 5 in. West Tire Setter.
1—Centrifugal Pump, 2½ in. x 1½ in. Gould.
1—Gould Triplex Power Pump, 2 in. x 3 in.

Milling Cutters and Reamers, full assortment, all sizes and shapes, at less than half price. Send us your enquiries.

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MACHINERY WANTED

WANTED—TWO 3-PHASE, 60-CYCLE, 2300-volt, 150 to 200 K.W. generators to run at speed of 720 r.p.m. or less, with sliding base and shaft for pulley drive. Generator should have outboard bearing and each complete with exciter and switchboard. Switchboard must be equipped with generator, field switch and rheostat; exciter field switch and rheostat, generator main oil switch, voltmeter, ammeter, instrument transformers and exciter ammeter. Box 774, Canadian Machinery. (c17m)

WANTED—STEAM ROLLER—ONE NEW REvolving steam shovel and concrete mixers. Box 773, Canadian Machinery. (c17m)

MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (etfm)

Used Machinery For Sale
1 12" x 7' Engine Lathe
1 16" x 6' Bertram Lathe
1 18" x 8' Stevens Lathe
1 42" Drill Press
1 26" Drill Press
1— 6" x 36" x 10' Bertram Planer
CHARLES P. ARCHIBALD & CO.,
285 Beaver Hall Hill - - MONTREAL
(52)

Modern Marine Machinery
Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

Used Belting, Pulleys, Etc.
We carry right in stock a large quantity of used Belting, Pulleys, Hangers, Shafting, etc., in good condition, which we sell at half the price of new. Inquiries solicited. In writing mention sizes wanted. L. S. Tarshis & Sons, 92 Wellington St., Montreal.

Grey Iron Castings
Light and Medium-Bench and Floor Repetition Castings; Capacity 15 tons per day. Expert Metal and Wood Pattern Work. Our advice and estimates will save you money. Semi-finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.
THE KATIE FOUNDRY, GALT, ONT.

REGO
WELDING
and
CUTTING APPARATUS
Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.
Carter Welding Co.
of Toronto, Limited
7-11 Sheppard St., Toronto, Ont.
Phones: Adelaide 2841 and 1524
(TF)

POSITIONS WANTED

DO YOU REQUIRE A MECHANICAL ENgineer, or shop superintendent? If so, I am open to accept a position of this nature from May 15th. Can supply first-class references. Have record for lowering cost of production. Will be pleased to talk matters over with anyone interested. Was 8 years with one concern. Box No. 775, Canadian Machinery. (c18m)

PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (etfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (etfm)

BUSINESS CHANCES

WANTED—BY AN ESTABLISHED CONCERN. Twelve to fifteen thousand dollars for a period of from one to three years, to take care of business expansion. This concern will stand the fullest investigation. 8% is offered with ample security to principals only, with an opportunity of becoming permanent associates with the partners, if mutually satisfied. Box 767, Canadian Machinery. (etfm)

ANNOUNCEMENT
The Electric Motor and Machinery Co., Ltd., 64 Wellington Street West, Toronto, Ontario, wish to announce the commencement of their sales agency for the
Howell Red-Band Motors Ltd.,
makers of **"the Guaranteed Motor."**
(c19m)

Sales Engineer wants to sell gasoline or oil engines, portable, stationary and marine or other machinery, to jobbers and dealers in the Province of Quebec or whole of Canada. Sold total output of one factory last year. Expenses and commission basis preferred. Box 768, Canadian Machinery. (c17m)

USED MACHINERY
in Good Condition

GRINDERS
1—No. 70 Heald Internal.
1—No. 75 Heald Internal.
1—10x24 Landis Plain.
1—Blount Wet Tool Grinder.
1—Globe Tool and Cutter.
1—No. 1 American Surface.

LATHES
1—18x10 ft. Bed McDougall, Q.C.G., Taper Attachment.
2—18" Davis Engine Lathes, 8-ft. Bed, Change Gears, D.B.G.
1—16" Davis Engine Lathe, 8-ft. Bed, Q.C.G., F.B.G., Turret and Cut-off Attachment.
4—16" Speed Lathes, 6-ft. Bed.
4—11" Speed Lathes, 5-ft. Bed.
3—No. 2 Warner Swasey Turret, 14".

DRILLS
1—20" Power Speed Drill, C.B.F.
2—Two-spindle, High Speed H.F. Allan B.B. Vertical Drill, hand feed, adjustable table, single head.
1—4-spindle Francis Reed Drill.

SCREW MACHINES
1 No. 4A Smurr & Kamen, G.F.H. and Power Feed.
1 1¼ x 8 Acme 18" Power Feed Turret, G.F.H.
2—6" Racine Power Hack Saws.
1—12" Crank Shaper.
1—No. 1 Burke Bench Miller.
1—6" Witton Centering Machine.

F. A. TENNISON
858 Dupont St., Toronto Jct. 3682

If interested tear out this page and place with letters to be answered.

MACGOVERN & COMPANY INCORPORATED POWER MACHINERY

We have for sale the following

Small Sized A. C. Generators

3 Phase, 60 Cycle

K.W.	Volt	Make	R.P.M.
15	2300	Ft. Wayne	....
KVA 20	2300	Fairbanks-Morse	1800
25	2300	Ft. Wayne	1800
30	2400	Westinghouse	1200
KVA 30	2300	Fairbanks-Morse	1200
KVA 35	2300	Allis-Chalmers	1200
37½	2300	Westinghouse	1200
42	2300	Electrical Machinery	1200
45	1150	General Electric	1200
50	550	Crocker-Wheeler	1200
50	2300	Fairbanks-Morse	300
50	2300	General Electric	900
60	2200	Warren	600
KVA 60	2300	Electric Machinery	900

MacGOVERN & COMPANY, INC.

285 BEAVER HALL HILL, MONTREAL

Offices: New York, Pittsburgh, Seattle. Plant: Linden, N.J.

Buyers and Sellers of New and Used Machinery

Would you buy a used machine if you knew that it was practically new?

OF COURSE YOU WOULD,

especially if you could buy at

A SAVING———YOU CAN.

Look these over—it might be here.

1—26" x 12' C.M.C., 3 step cone, D.B.G., Q.C.G., hollow spindle, face plate, follow rest, complete with countershaft and regular equipment; can be inspected under belt $900

1—No. 4 Greenard Arbor Press, like new 125

1—No. 9 Hendey Whitmore Double End Punch and Shear, ½" in ½"; can be inspected under belt 500

1—20" Barnes Drill, W and L feed, T and L pulley, in A1 condition 150

1—50 H.P. International Harvester Gas Engine, Mogul type, in A1 condition 675

1—175 H.P. John Inglis steam engine, 90 lbs. 500

A full line of lathes, millers, grinders, drills, motors, planers, engines, boilers, presses, shapers, wood-working machinery—all for immediate delivery.

The above is only a partial list of good as new machines that you can buy to-day far below the price that new ones will ever be. Send me your inquiries and let me convince you that I am right there with the goods and the lowest prices.

R. S. HOLLY

Suite 502, Kent Building Telephone Adelaide 3147

TORONTO, ONTARIO

BAIRD - DETROIT

SPECIAL OFFER

2 USED NO. 2A WARNER & SWASEY UNIVERSAL HOLLOW HEXAGON TURRET LATHES

Geared Head, Power Feed to Turret and Cross-Slide, 2⅝" hole through spindle, Chucks, Tools and Countershaft

CAN BE INSPECTED IN OUR DETROIT WAREROOMS

PRICE F.O.B. WINDSOR, ONT., EACH $1160

DUTY PAID - FUNDS PAID IN CANADIAN CURRENCY

OTHER BARGAINS

1 Used 3" Model A Cleveland Automatic.
3 Used ⅝"-⅞" Model A Cleveland Automatic.
1 Used 1¼" Model A Cleveland Automatic.
6 Used No. 1 Fraser Universal Grinders, capacity 8" x 20".
3 Used No. 200 Heald Rotary Surface Grinders, 8" chuck.
1 Used 12" Persons-Arter Rotary Surface Grinder, with generator attached.

W. J. BAIRD MACHINERY CO.

JEFFERSON AT BRUSH ST., DETROIT, MICH.

If interested tear out this page and place with letters to be answered.

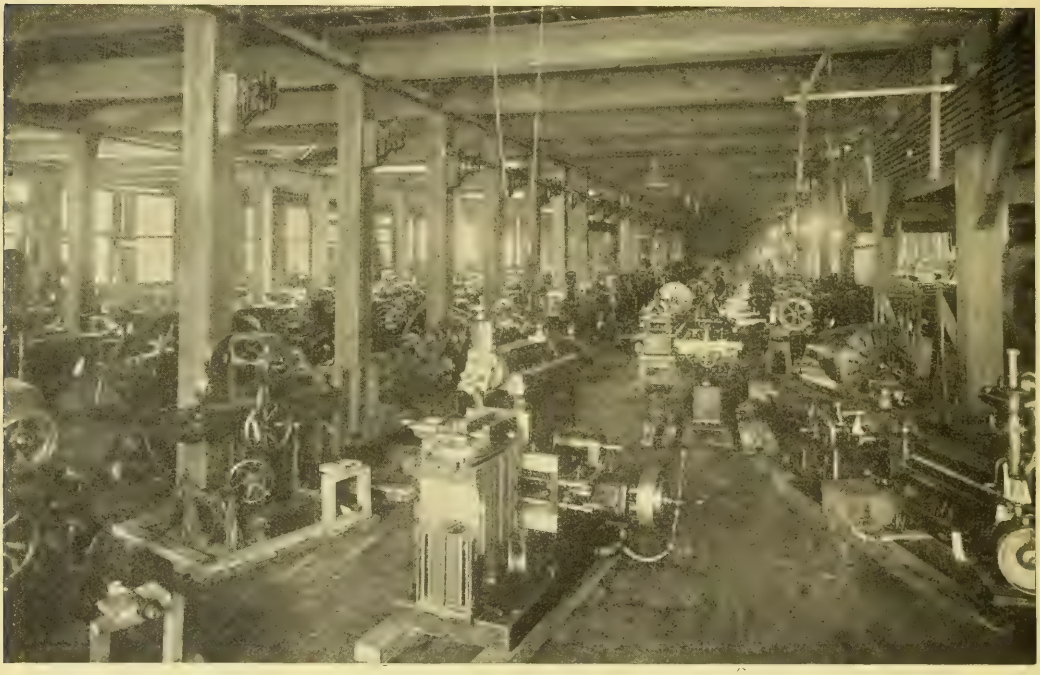
Garlock-Walker Machinery, Limited

567 Banning St.
WINNIPEG
Man.

32 Front Street West
Toronto
Warehouse:
163 Dufferin Street
Telephone: Adel. 6356

334 St. James St.
MONTREAL
Que.

Interior View of Our Warehouse



MACHINERY SERVICE

This little glimpse into a corner of our warehouse will give you some idea of our ability to serve you when you want iron or woodworking tools, new or used.

Over 20,000 square feet in this warehouse is filled with every variety of equipment for machine shops and woodworking factories.

You will find Garlock-Walker service thoroughly dependable. Let us know what machinery you require.

List of new and used machinery in stock for immediate shipment and priced to sell under present conditions.

If interested tear out this page and place with letters to be answered.

LATHES

1—144″ x 12′ Berg Pit Lathe (used).
1—36″ x 18′ Putnam (used).
1—36″ x 16′ London (used).
1—30″ x 12′ Blaisdell (used).
1—30″ x 14′ Niles-Bement-Pond.
1—26″ x 14′ Niles-Bement-Pond, Q.C.G.
1—24″ x 10′ Milwaukee, Q.C.F.
1—24″ x 12′ C. M. C., Q.C.G.
1—20″ x 10′ Rahn (used).
1—20″ x 6′ Le Blond Heavy Production (used).
1—18″ x 8′ Milwaukee, Q.C.F.
1—18″ x 8′ Rae, Q.C.G.
1—16″ x 6′ Reid, Q.C.G.
1—14″ x 6′ Hamilton, Q.C.G.
1—12″ x 8′ Le Blond Tool Room, Q.C.G.
1—12″ x 6′ Worcester, Q.C.G.
1—8″ Rivett Precision Bench with Cabinet and Attachments.
1—7″ Cataract Precision Bench, Chasing Attachment, Turret and Double Tool Cross-Slide.
1—7″ Cataract Precision Bench, Standard Equipment.
3—American Brass Lathes, 18″ x 6′ Bed, with Turret (used).

GAP LATHES

1—38″ x 54″ x 12′ Bertram.
1—22″ x 40″ x 16′ McDougall.
1—21″ x 30″ x 7′ South Bend.
1—20″ x 38″ x 12′ C.M.C.

TURRET LATHES

2—American, 24″, Power Feed to Turret.
2—Davis, 24″, Power Feed to Turret.
2—Oliver, 18″, Power Feed to Turret.

SCREW MACHINES

12—Millhollands, No. 4, 1⅝″ Capacity.
1—Garvin, 12 S.P., Capacity 1 7-16″.
1—Prentiss, Capacity 7-16″.

SCREW MACHINES

1—Wells, 1″ Capacity.
1—Warner & Swasey, No. 2.
1—Hartford, Full Automatic, Capacity 1⅝″.
1—National Acme, No. 54.
1—National Acme, No. 53.

SPINNING LATHE

1—No. 5 Bliss Spinning Lathe, 24″ Swing x 5′ 9″ Bed, Full Attachments.

SHAPERS

1—16″ Mackenzie (new).
1—16″ Rae.
1—16″ Butler.
1—24″ McGregor-Gourley.

PLANERS

1—42″ x 42″ x 20′ Putnam, 1 Head.
1—48″ x 48″ x 14′ Patch, 4 Heads.
1—36″ x 36″ x 24′ Sellers, Open Side, 3 Heads.
1—30″ x 30″ x 10′ Pond, 1 Head.
1—24″ x 24″ x 6′ Powell, 1 Head.

MILLING MACHINES

1—Briggs High Duty, Type "A," 22″ Traverse (new).
1—Briggs High Duty, Type "B," 42″ Traverse (new).
1—Ryerson-Owen No. 3 Universal (new).
1—Ford-Smith No. 3 Universal (used).
1—Ford-Smith No. 3 Plain (used).
1—Cincinnati No. 4 Plain (used).
1—Whitney Hand Miller, 18″ x 6″ Table (used).
1—Ford-Smith Plain Dividing Head with Vise—(14″ Swing) (used).

DRILLS

1—10″ Burke Sensitive, Bench Type (new).
1—15″ Rockford (used).
1—16″ Edlund, No. 2B, H.S. Sensitive (new).
1—20″ Silver, B.G., W. L. & P. Feed, Auto. Stop (new).
1—20″ "Champion," B.G., W. L. & P. Feed, Auto. Stop (new).
1—20″ Rockwell, B.G., W. L. & P. Feed, Auto. Stop (used).
1—20″ Sibley, B.G., W. L. & P. Feed, Auto. Stop (used).
1—3-Spindle Silver Gang Drill, 20″, Tapping Attachment (used).
4—4-Spindle W. & R. Sensitive, Cap. ½″ (used).
1—36″ C.M.C., Heavy Duty (used).
1—36″ Bertram, Heavy Duty (used).
3—National Acme Horizontal Drills (½″ Cap.) (used).

BORING MACHINES

1—66″ Bement-Niles Vertical, 2 Heads, 24″ Under Rail (used).
1—Universal, No. 2½, Horizontal, Table 42″ x 22″ (used).
1—Bullard, "New Era," Vertical Turret, 36″, Complete Equipment (new).

POWER HACK SAWS

1—No. 10 Racine, 8″ x 8″ Cap. (new).
1—No. 7 Watkins, 9″ Cap. (used).
1—No. 1 Racine, 6″ x 6″ (used).
1—Peerless, 6″ x 6″ (used).

AIR COMPRESSORS

1—8″ x 8″ Sullivan, Class WG-3, Belt Driven (used).
1—8″ x 10″ x 8″ Bury, Steam Driven (used).
1—12″ x 18″ Ingersoll-Sargent, Belt Driven (used).
1—12″ x 12″ Can. Ingersoll-Rand, Belt Driven (used).
1—3″ x 1½″ x 3″ American, Motor Driven (used).

GRINDING MACHINES

1—Landis No. 4 Universal (used).
1—Landis, Plain, Self-contained, 36″ x 12″ (used).
1—Landis, Plain, 42″ x 12″ (used).
1—Fitchburg Cylindrical, 8″ x 36″ (new).
1—Globe Universal Tool and Cutter Grinder (new).
1—Le Blond Universal Tool and Cutter Grinder (used).
1—Cincinnati Universal Tool and Cutter Grinder (used).
1—Gardner No. 12, Double Disc, 18″ Discs, with End Grinding Attachment (used).
1—Diamond Surface Grinder, Table 84″ x 30″, Cup Wheel 24″ Dia. (used).
1—Lafayette Universal Grinder.
Several Pedestal Emery Stands.

PUNCHES, SHEARS AND PRESSES

1—Lennox Rotary Bevel Shear (1″ Cap.) (new).
1—Crowell Hydraulic Rocking Press, with Pump (used).
1—Greenerd No. 3½ Arbor Press, with Stand (used).
1—Greenerd No. 3½ Arbor Press, without Stand (new).
1—Ryerson Single End Punch (½″ Cap.) (new).
3—Ryerson Single End Punches (¾″ Cap.) (new).
1—No. 19 Inclinable Power Press (new).
1—Newell Foot Power Press.
1—68N Bliss Double Action (used).
1—No. 57½ Toledo (used).

MISCELLANEOUS

2—No. 4 John Hall Pipe Machines (new and used).
1—High Speed Riveting Hammer, No. 3 "A" (used).
1—Beaudry "Champion" Power Hammer, No. 9 (used).
1—Grant Rivet Spinning Machine, Pedestal Type, No. 80A, 3-16″ Cap. (new).
1—Grant Rivet Spinning Machine, Bench Type, No. 80B, 3-16″ Cap. (used).
1—Leader Polishing Lathe, Motor Driven, Direct Current, 5 H.P., 115 Volt, 2,800 R.P.M. (used).
1—Roots No. 1 Low Pressure Blower.
1—Sheldon No. 2 Forge Blower.
1—Buffalo No. 3 Forge Blower (7″ opening).
1—Buffalo No. 3 Pressure Blower (4½″ opening).
1—Sturtevant 60″ Single Exhaust Fan.
1—Sturtevant 48″ Single Exhaust Fan.
1—Sturtevant 36″ Single Exhaust Fan.
1—Sturtevant 45″ Double Exhaust Fan.
1—Detroit No. 16 Single Exhaust Fan (16″ opening).
1—Herbert Morris Portable Crane, 1½ Ton, 10′ Lift.
1—Canton Portable Crane, 2 Ton, 5′ Lift.
1—Canton Portable Crane, 1 Ton, 8′ 6″ Lift.
1—West Magott Gas Furnace, 10″ x 8″ Opening (used).
1—Bellevue Double Chamber Oil Furnace, 9″ x 5″ openings (used).
Transmission Equipment, Pulleys, Belting, Shafting and Hangers.

POWER EQUIPMENT

1—75 H.P. Bell High Speed Engine (used).
Several Motors (Various Sizes) (used).

FRICTION SAWS

1—46″ Ryerson, with 52 H.P., 220 V., D.C. Motor (used).
1—22″ Ryerson, with 35 H.P., 550 V., 25 Cy. Motor (used).

Garlock-Walker Machinery, Limited

32 Front Street West, Toronto

567 Banning St., Winnipeg *Warehouse:* 163 Dufferin Street 334 St. James St., Montreal

If interested tear out this page and place with letters to be answered.

IMMEDIATE SHIPMENT—TORONTO STOCK

COLD ROLLED STRIP STEEL

10,800 lbs. .028″ x 2⅞″, soft, 6′ lengths.
2,000 lbs. .028″ x 4″ , dead soft, 8′ lengths.
7,000 lbs. .028″ x 6″ ″ ″ 8′ ″
2,500 lbs. .032″ x 4″ ″ ″ 8′ ″
5,100 lbs. .032″ x 8″ ″ ″ 8″ ″
2,000 lbs. .035″ x 1⅛″, soft, coils.
2,200 lbs. .035″ x 6″ and 8″, dead soft, 8′ lengths.
3,500 lbs. .050″ x 1½″, hard, 8′ lengths.
2,000 lbs. .050″ x 1¾″, dead soft, 7′ lengths.
3,400 lbs. .050″ x 4″, dead soft, 8′ lengths
6,200 lbs. .050′ x 5¾″ ″ “ 8′ “
2,800 lbs. .050″ x 6″ ″ ‘ 8′ ″
6,500 lbs. .062″ x 6″ ″ “ 8′ “
3,800 lbs. .062″ x 8″ ″ “ 8′ “
12,000 lbs. .062″ x13″ ″ “ 104″ “
6,500 lbs. .065″ x 6″ ″ “ 6′ “
700 lbs. .073″ x 6″ ″ “ 8′ “
500 lbs. .083″ x 1¾″, half hard, 6′ “
1,600 lbs. .100″ x 4⅛″ ″ “ 10′ ″

Write us for complete lists.

Auto Body Sheets—Black and Galvanized Sheets.
Tubing
Brass and Copper Bars and Sheets.

YOUR ENQUIRIES SOLICITED.

ONTARIO METAL PRODUCTS
Co., Limited

237 Dufferin Street -- -- Toronto, Canada

GOOD OPPORTUNITIES HERE

STEEL PLANT EQUIPMENT

6—Herault Electric Furnaces, 6 ton, tilting type, complete with transformers and auto regulators.
1—Williams Cut Off Machines, hollow spindle, taking up to 9½″ bar stock.
1 Ajax Bulldozer, No 12, jaw opening 74″ x 72″ deep, approximately 12″ stroke.
6—Deane Horizontal, double plunger Pumps, 4½″ x 18″, capacity 200 gallons at 1,500 lbs working pressure, being motor driven and complete with motors.
4 Kennedy Billet Shears, double head, 14″ capacity.
1—Combined Punch and Shear, 10″ throat.
5—New, Pittsburgh Ladles, cast steel, bottom discharge, 15 ton.
4—Used, Pittsburgh Ladles, cast steel, bottom discharge, 12 ton.
5—Used, Steel Plate Ladles, bottom discharge, 9 ton.
1—Used, Tilting Type Ladle capacity 6 ton.
1—Gordon & Maxwell, Duplex Hydraulic Pump, 20″ x 7½″ x 18″
1—Gordon & Maxwell, Duplex Hydraulic Pump, 19″ x 6½″ x 18″

MACHINE TOOLS

Lathes

1 Bertram Engine Lathe, 20″ x 10′ bed
1—Sidney Engine Lathe, 18″ x 10′ bed.
1 Pond Engine Lathe, 20″ x 8′ bed, taper attachment
1—Herrington Engine Lathe, 24″ x 14′ bed.
1—Lodge & Davis Engine Lathe, 14″ x 18′ bed.
1—Fay & Scott Engine Lathe, 40″ x 12′ bed

Shapers

1—Norton, 20″, Table 20″ x 20″
1 Petrie Crank Shaper, 14″.

Drills

1 New, Barnes, 22½″, 2 spindle, style “B.”
1—Foote-Burt, Heavy Duty, Table 20″ x 20″.
1 Herrington, Heavy Duty, 18″, Type 67

Steam Hammers

1 Sellers Steam Hammer, 3,000 lbs.
1—Beaudry Power Hammer, No. 12, 500 lbs.
1 Bartlett Power Hammer, 200 lbs.
1 Beaudry Belt Driven, 1″ size.

Planers

1—Herrington, single head, Planer, 32″ x 8′.

Hack Saws

2 Racine, drawcut, capacity 11″
14—Racine, drawcut, capacity 5″.
2 Victor, drawcut, capacity 8″.

Gear Hobber

1—New, Barnes, No 1 Gear Hobber

AIR COMPRESSORS

Belt Driven

2 Canadian Ingersoll-Rand, Cross compound, 16″ and 9″ x 16″, 780 cu. ft. at 100 lbs.
1 Canadian Ingersoll Rand, two stage, 14″ and 9″ x 12″, 400 cu. ft at 100 lbs.
1 Burs, 12″ x 12″, 340 cu ft. at 100 lbs.
1—Burs, 10″ x 10″, 150 cu. ft. at 100 lbs.
1—Sullwan, 12″ x 12″, 345 cu. ft. at 100 lbs.

Steam Driven

1—Ingersoll Rand, Corliss Type, cross compound, 2 stage, cylinders 20″, 30″ 30″ x 36″ stroke, 1,920 cu ft. at 100 lbs
1 Ingersoll Sargent, cross compound, 2 stage, 14″ and 22″ x 18″, 900 cu ft at 100 lbs
1 Canadian Rand, straight line, 12″ and 12″ x 18″, 280 cu. ft. at 100 lbs.
1—Ingersoll Rand, two stage, 15″ and 25″ x 24″, 1,600 cu. ft at 100 lbs., direct connected to 25 cycle Westinghouse Motor.
1—Canadian Rand, two-stage, cross compound, 12″ and 20″ x 18″, 18″ and 12″ x 18″, 775 cu. ft. at 100 lbs.

PUMPS

1—No 7 Cameron Sinking Pump
3—No. 2 Cameron Removable Bushing Pattern Pumps.
1—Cameron Prospectors' Sinking Pump.
1—Swaby two-stage Centrifugal Pump, 3″ suction, 2½″ discharge, direct connected to 15 H.P. Motor.
1—Swaby two-stage Centrifugal Pump, 1½″ suction, 1½″ discharge, direct connected to 5 H.P. Motor.
1—Cameron, No 2, four-stage Centrifugal, direct connected to 30 H P Motor, complete with auto float starter.
1 Worthington Boiler Feed Pump, 14″ x 8½″ x 12″.
2—Duplex Boiler Feed Pumps, 3″ x 2″ x 3″.
2 Edwards Triplex Pumps, 6″ x 8″.
2—Myers Geared Pumps, 2½″ suction, 2½″ discharge
3 Fairbanks Oil Pumps, 1½″ x 2″ x 12″
1 Pulsometer Pump, No 2, 1½″ x 1½″.
1—Birdsboro Centrifugal Sand Pump, 24″, complete with base and sub-base for direct connection to Motor

WILSON-McGOVERN, Limited, Lumsden Building, Adelaide St. E.
TORONTO, ONTARIO

KIM-O *The Boiler Compound That Has No Equal.*

Oils, Soaps, Greases, Roofing Paint, Machinery.

1—Belliss & Morcom Engine, 750 H.P.
1—Belliss & Morcom Engine, 135 H.P.
2—Wheelock Engines. Each 75 H.P. One with Heater and Pump attached.
1—30 x 6 Upright Boiler, complete.
1—42 x 7 Upright Boiler, complete.
Numerous other Boilers and Engines on hand.

Write us your requirements. We can satisfy you. Boilers sold subject to inspection only.

THE BOILER & ENGINEERING EQUIPMENT CO., REG.
Office: 222 CRAIG ST. W., MONTREAL, P.Q.

Our Loss--Your Gain

Here are a few opportunities for you to save some money:

2—26 x 12 first-class used C.M.C. Lathes, $650 each.

2—No. 0 B. & S. used Automatics, $650 each.

2—No. 2 B. & S. used Automatics, $750 each.

These are a few. Write us about other new and used machines we are offering at reduced prices, such as Gap Lathes, Turret Lathes, Shapers, etc.

Williams & Wilson, Limited
84 Inspector Street
MONTREAL

The Kaitting List Of Second-Hand Machinery

Two turret lathes, Warner & Swasey make.
One engine lathe, 21″ x 12′, McGregor-Gourlay make.
One Corton Disc Grinder, 20″, with press.
One 30″ band saw, manufactured by the Preston Machine Co.
One London engine lathe, 20″ x 10′.
One three horsepower electric motor, Westinghouse.

Geo. C. Kaitting & Son
54 & 56 Ainslie St. S.
Galt, Ontario

Machinery For Sale

LATHES

20″x10′-0″ Cisco Heavy Duty Engine Lathes, Q.C.G., D.B.G.	$1,000.00
19″x8′-0″ Le Blond Heavy Duty Engine Lathes, Q.C.G., D.B.G.	900.00
16″x10′-0″ Cisco Engine Lathe, Q.C.G.	800.00

DRILLS

Avery Sensitive Drill Press, Bench Type.	$ 75.00
14″ Single Spindle “Perfect” Pedestal Drill Press	75.00
Two Spindle Pedestal Drill Press	75.00

MISCELLANEOUS

Pedestal Grinders ..... Each	$ 35.00
“Modern Machine Co.” Chaser Grinder.	100.00
No. 180 B & B Inclinable Punch Press	250.00
Heavy Duty Polishing Lathes	40.00 60.00
2—50 Gal. “Pendrith” Candy Mixers Each	85.00
Robertson Power Hack Saw	35.00
“Chapman” Elevating Truck	75.00
2—Garvin No. 1 Rapid Castellating Machines ..... Each	25.00
1—No. 1 Acme Screw Slotting Machine.	175.00
1—National Acme Centering Machine	50.00
20″ Silver Drill Press	150.00
No. 6 Brown & Sharpe Turret Lathe	450.00
4′-0″ “B. & B.” Power Squaring Shear, Practically New	1,000.00
No. 18 Globe Co. Cleveland “Tumbling Barrel,” New	225.00

Pulleys, Hangers, Shafting.

All Used Equipment Is Guaranteed in First-Class Running Order.

GENERAL MACHINERY COMPANY
Telephone Main 2200
67-69 Frederick Street
Toronto

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Machinery and Equipment

PUNCHES AND SHEARS

S. 22B 1—6" throat, Hilles & Jones No. 1 Horizontal Punch.
S. 38B 1—Size T40, Henry Pels & Co., John's Patent Shears.
W. 5B 1—30" Jumbo Punch, cam shaft drive off pulley shaft, 7/8" hole and 7/16" plate. Die block, slipper, belt drive.
W. 13B 1—56" throat, American Ship Vertical Punch; capacity 1" through 1" ; belt drive, with T. & L. pulleys.
W. 40A 1—No. 5 60" throat, Southwark Vertical Punch.
W. 6B 1—12" throat, Hilles & Jones Bar Shear.
W. 49A 1—48" throat, Southwark Plate Shear.
W. 31A 1—48" throat, quick work Rotary Shear.
W. 17B 1—14" throat, Coping Shear.
D. 87A 1—No. 252 Niagara Squaring Shear.
D 46B 1—No. 352 Niagara Squaring Shear; cuts and squares 14 gauge mild steel; has 16" throat for trimming and splitting; T. & L. pulleys, 4½" belt, cam and lever hold down.
D. 48B 1—Foot Squaring Shear; 22" knife; capacity to cut 24 gauge mild steel. Light machine.
D. 43B 1—2A 30" throat, quick work Rotary Shear, 4 speed changes; cuts curves of any radius and will cut minimum round hole 5½" diameter. Capacity up to 5/32" mild steel. Belt drive.
CL 4B 1—30" gap, Globe Iron Works Double End Punch; one end 1" hole and ½" plate; other end 1" hole and ¾" plate. Belt drive.
CL 16B 1—36" throat, American Ship Single Vertical Punch; belt drive; capacity 1" through 1".
B 9A 1—12" throat, Southwark Horizontal Punch.
B 7A 2—84" throat, Long & Alstetter Plate Punches.
B 27B 1—Size T-40 Henry Pels & Co., John's Patent Shears.
B 28B 1—42" throat, Plate Shear; capacity to shear 1" plate.
B 6A 1—84" throat, Long & Alstetter No. 2 Single Plate Shears.
B 8A 1—No. 4B Quick Work Rotary Shear.
L 13B 1—36" throat, Cleveland Ship Building Co..
L 21B 1—36" throat, Cleveland Ship foot operated Single Punch.
L 14B 1—32" throat, Cleveland Punch and Shear Manhole Punch.
L 24B 1—18" throat, Channel Shear.

Polishing Machines

D 57A, D 58A, D 81A 3—No. 5 Webster and Perks Double Spindle Polishing Machine.

Drills

Ch. 25A 1—25" Barnes upright Drill Press.
Ch. 32A 1—26" Barnes back geared upright Drill.
Ch. 45A 1—30" Putnam upright Drill.
L 2A 1—Aurora Upright Drill.
L 10A 1—48" Morris Plain Radial Drill.
L 26A 1—48" Reed Prentice Plain Radial Drill.
L 39A 1—6' American Plain Radial Drill.
L 15B 1—16' arm, Post Radial Drill, made by Cleveland Punch and Shear Works.
D 30A 1—Radial Reed Prentice 6' Standard.
D 20A 1—5' Arm Radial Drill, Niles-Bement-Pond semi-universal.
D 57B 1—12" Burnham Sensitive Drill.
D 15B 1—20" Barnes Upright Drill.
D 32B 1—Foote-Burt, 4 spindle, No. 2 Mud Ring and Flue Sheet Drill.
Ch. 33B 1—15' arm, Post Radial with No. 3 Morse taper socket.
Ch. 29B 1—24" Dallette Portable Radial Drill.

Rolls

S 41B 1—Set Hilles & Jones Mangle Rolls, 6" 10" rolls, 5" 2" between housings, takes 7' 6" plate, hand adjustment.
D 54B 1—Set Forming Rolls, Peck, Stowe & Wilcox.
D 72B 1 Set 30" Hand Power Forming Rolls.
B 53A 1—Set 16' Hilles & Jones Bending Rolls. Pyramid Type, top roll 14" diameter, bottom rolls 12" diameter

Milling Machines

D 110A 1—Milling Machine, No. 3B Milwaukee Plain, Kearney and Trecker make
D 116A 1 No. 3H LeBlond Heavy Duty Miller.
W 24B 1 No. 2 LeBlond Plain Miller
D 40A 1 No. 5 Cincinnati Plain Milling Machine.
D 41A 1 No. 4C LeBlond Milling Machine
D 80A 1 No. 5 Cincinnati Universal Mill ing Machine.
D 53A 1 24" x 24" x 12' Ingersoll Mill ing Machine.
D 39A 1—No. 6 National Transit Plain Milling Machine
D 84A 1 No. 2 Rockford Universal Milling Machine.
D 13B 1—No. 5 Brown & Sharpe Plain Milling Machine

Rivet and Bolt Headers

S. 29B 1½" to 1¼" Ajax Single Rivet Heading Machine.
S. 35A 1—Improved 1¼" Ajax Steel Bolt, continuous motion, hand feed Heading Machine.

Riveters

S. 30B 1—Wm. Sellers Co., Upright Stationary Steam or Air Riveter.
CL. 29B 1—10" gap, Morgan Horizontal Hydraulic Riveter.
Ch. 19A 1 Hanna 75" gap Bull Riveter

Rivet Machine

B 46A 1—Acme A Rivet Machine

Rivet Forges

B 16A 24 Rivet Forges.

Tables—Punch

W 41A 2—Lassdin Punch Tables, capacity to handle 2" plate

BORING MILL

S 12A 1 7'x10' Betts Vertical Boring Mill.
B 23A 1—48" Niles Vertical Boring Mill.
Ch 1B 1—36" Sellers Horizontal Boring Mill.
CL 25A 1—24"x24"x24" Giddings and Lewis No. 0 Horizontal Boring Mill.
CL 36A 1—48" Gisholt Vertical.
CL 29A 1—Sellers 84" Vertical.
D63A 1—60" Derrick and Harvey Horizontal Boring, Drilling and Milling Machine.
D66A 1—60" Gisholt Horizontal Boring Mill.

RIVET HEADERS

W 12A 1—National Rivet Header, Capacity up to 1¼" diameter by 9" long rivets.
Ch 51A 1—Acme size A, All steel open die Rivet Making Machine.
Ch 23B 1—½" to 1½" x 5" Ajax Rivet and Bolt Making Machine.

GANTRY CRANES

W 9A 1—15-ton Link-Belt steam operated variable Radius Gantry Crane, 90' steel boom.
Ch 37B 1—Brown-Hoist Gantry Crane, 120' boom.
Ch 26B 1—Gantry Crane, 172' Boom, 49' rail centers. Hook travel 149'. Clear lift 50' 10". Will be sold complete with 314' long trestle. 30' 10" high. Crane capacity ten tons at end of boom. Equipped with three 220V. D.C. Motors.
Ch 14A 1—15 ton Link-Belt, 8-wheel single drum, steam operated Gantry Crane, mounted on Gantry sub-structure 30' high. 90' steel boom, 20' rail centers, 54" x 6' boiler for 125 lbs. pressure.
Ch 14A 1—14-ton Link-Belt 8-wheel single drum, steam operated Gantry Crane, mounted on Gantry sub-structure 34' high. 90' steel boom, 20' rail centers, 54" x 6' boiler for 125 lbs. pressure.
S 39B 1—Electric Drive Steel Gantry Crane, with 170' boom. 55' lift. Capacity 5 tons, 80' from center, 18' span. Will be sold with runway 580' long.
S 2A, S20A 2 15-ton Link-Belt, fill revolving, steam operated.

OVERHEAD CRANES

W10A 1 7½-ton Toledo, three motor Travelling Crane, 72' 5" span, 30' lift.
W 11A 4—7½ ton Toledo three motor Travelling Cranes, 87' 5" span, 80' lift.
Ch 24B 1—10-ton P. & H. overhead Travelling Crane.

CRANES

B 10A 4—3-ton Sprague Electric Monorail Cranes, 15' lift. Remote controlled. With trailing operator's cage. Complete with one 35 KW Generator set; 3 phase, 25 cycle, 220 V, on AC end; 220 V, DC on Generator end.
B 11A 1—10-ton Lakeside Electric Gantry Crane and trackage. Single line equipment. 67' span. 60' lift. Equipped with four 3 phase, 25 cycle, 220 V Motors.
B 59A 1—Hand Operated Overhead Traveling Crane, with 14' 9" rail centers, capacity 3 tons.
L 32A 1—20-ton Champion Electric Travelling Crane with 5-ton auxiliary hoist.
L 25B 12—Pedrick and Ayer Jib Cranes, 17' 10" arms.

WALL CRANES

Ch 32B 9—17 6" arm Wall Cranes, with 4 wheel carriages.

Tanks---Oil Storage

CL 52A 2—Oil Storage Tanks, 8' x 36', equipped with 3" steam coils, two 2" drains, 2" vent, and 3" pump inlet, 5-16" plate, 14,500 gals cap each
CL. 53A 1 Oil Storage Tank, 8'x26' 6" long, equipped with 3" steam coils, two 3" drains, 2" vent and 3" pump inlet, 5-16" plate, 9,950 gallons capacity.

Shaper

L. 19A 1—24" Gould & Eberhardt Shaper

Slotters

L 21A 1—18" Newton Vertical Slotter
CL. 40A 1—18" Newton Vertical 48" diameter table.

Tube Bender

L 33A 1—Wonder Boiler Tube Bender

Plunging Press

CL 26B 1—75 ton Morgan Engineering Co. Plunging Press.

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for Sale---Immediate Delivery

LATHES

L 36A 1—16″ x 7′ Le Blond double friction back geared screw cutting Lathe.
L 5B 1—24″ x 16′ 0″ Pond back geared Lathe.
L 4B 1—18″ x 4′ 10″ Dietz-Schumaker & Boyce back geared rack and screw feed Lathe.
L 13A 1—42″ x 30′ 0″ Elyria roughing Lathe.
L 3A 1—42″ x 30′ Elyria roughing Lathe.
L 3B 1—26″ x 14′ 0″ Pond back geared Engine Lathe.
CL 15A 1—14″ x 8′ Champion Screw Cutting.
CL 28A 1—24″ x 14′ Boyce and Emmes double back geared Engine Lathe.
CL 46A 1—42″ x 28′ Pittsburgh; heavy duty; triple geared; face plates; steady and compound rests; driven by 20 HP, 230 V, 400-1200 RPM, D C Westinghouse type SK Motor.
Ch 10A 1—16″ x 8′ South Bend back geared Engine Lathe.
Ch 6B 1—21″ x 8′ bed, Bradford Lathe; back geared.
Ch 5B 1—26″ x 12′ Dietz-Schumaker & Boyce back geared Engine Lathe.
B 3B 1—32″ x 20′ New Haven Engine Lathe.
B 2B 1—34″ x 8′ Putnam back geared Engine Lathe.
L 29A 1—36″ x 22′ 0″ Putnam Lathe.
L 17A 1—27″ x 20′ American Lathe.
D 17A 1—20″ x 10′ 8″ Walcott Engine Lathe.
W 51A 1—18″ x 10′ Walcott Engine Lathe.
W 52A 1—19″ Sidney Engine Lathe.
W 53A 1—New Haven Pipe Facing Lathe.
D 34B 1—28″ x 16′ 4″ New Haven Single Back Geared Engine Lathe.
D 91A 1—26″ x 18′ 6″ Walcott Double Back Geared Engine Lathe.
D 23B 1 30″ x 23′ 11″ Pond Single Back Geared Engine Lathe.
D 35B 1—21″ x 10′ 5″ bed Hamilton Double Back Geared Engine Lathe.
D 51A 1—30″ x 37′ 6″ Wickes Double Back Geared Engine Lathe.
D 11A 1—26″ x 14′ 6″ Walcott Double Back Geared Engine Lathe.
D 90A 1—26″ x 16′ 5″ Walcott Double Back Geared Engine Lathe.
D 52A 1—No. 9 Empire Irregular Type Wood Turning Lathe.

TURRET LATHES

D 5B 1—Bardons and Oliver Turret Lathe.
D 9B 1—Warner and Swasey Turret Lathe.
D 83B 1—Bardons and Oliver Turret Lathe.
W 27B 1—Foster Machine Company Turret Lathe.
D 16A 1—18″ x 8′ Walcott.
D 50A 1—Lathe, 24″ Gisholt Turret.
D 37A 5—2¼″ x 10″ Mulholland Turret Screw Machines.
D 68A 3—1⅝″ x 10″ Turret Lathe Screw Machine.

Flanging Press

CL 18A 1—200-ton Southwark Hydraulic.
L 12B 1—Morgan Engineering Works 75-ton Hydraulic Flanging Press.

Saws

S 27B 1—24″ Newton Cold Saw. Will cut up to 6″ square.
D 60A 1—No. 18 Lea Simplex Cold Metal Saw.
1—Saw Sharpening Machine for Lea Simplex Cold Saw.

AIR RECEIVERS

S 48A 1 Ingersoll-Rand No. 7, Vertical Steel Air Receiver, 54″ x 12′, complete with all fittings.
B 14A 2—54″ x 12′ Chicago Pneumatic Vertical Air Receivers.
Ch 50A 1—42″ x 10′ Kewanee Vertical Air Receiver.
CL 49A 1—48″ x 9′ Kewanee Vertical 2 course Air Receiver.
L 1A 1—36″ x 9′ Vertical Two Course Air Receiver.
L 37A 1—48″ x 12′ Vertical Air Receiver.
L 37A 2—54″ x 12′ Kewanee Vertical Air Receivers.

CARS

CL. 11A 1—Saddle Boiler Car, 32′, 4″ long overall; capacity 70 tons. Built to M C B requirements, all steel construction.
CL. 103A 2—Saddle Boiler Cars, M C B requirements, all steel construction, 32′ 4″ long overall; 30′ long, not including couplers.

PIPE MACHINES

Ch. 33A 1—D Saunders Pipe Machine, capacity 1″ to 4″.
Ch. 46A 1—Crane Co. Pipe Machine, capacity 1″ to 4″, Eaton Cole and Burnham Type.
B 12A 1—Lovekin A Pipe Expanding and Flanging Machine, capacity, 2″ to 6″.

Hoist—Electric

Ch. 54A 2—Thomas Double Drum Hoists, band friction type with reverse mechanism for slewing.

Generators

B 25B 1—Fairbanks Morse 2½ K.W., 115 V, type T R, Generator.
CL. 37B 1—30 K W Card, 240 V, 775 R.P.M., belt drive.

Bolt Cutters

S 19A 1—2½″ Acme Bolt Cutter.
S 50B 1—Acme Single Bolt Cutter, 1½″ to 2″ capacity.
CL. 26A 1—1½″ Merriman Single head.
CL. 47A 1—4″ Landis Single head.
D 82B 1—3½″ National Bolt Cutting Machine.
D 25B 1—1½″ Acme Bolt Cutting Machine.

Nut Tapping Machine

D 42A 1—Nut Tapping Machine; 10 Spindle.

Transformers

Ch. 49A 3—833 KVA General Electric Type, WC, form BDH, 60 cycle, transformers.

Hammers

L 31A 1—2,000-lb. Bement Single Frame Steam Hammer.
L 31½A 1—2,400-lb. Bement Single Frame Steam Hammer.

Planers

D 81B 1—24″ x 24″ x 6′ Pease Planer.
W 23B 1—36″ x 36″ x 10′ Pond Planer.
L 16A 1—72″x72″x20′ Standard Cincinnati closed side Planer.
L 27B 1—48′ x 48″ x 16′ Pond Planer.
CL. 50A 1—48″ x 48″ x 20′ Patch Planer.
B 24A 1—60″ x 60″ x 20′ Sellers closed Side Planer.

Woodworking Machinery

B 23B 1—McKinnon Wood Cutting Jig Saw, with semi-universal head.
B 21B 1—15″ Fay & Egan Four side "Lightning" Planer and Matcher.

Air Compressors

S. 17A 1—2,000 Cu. Ft. class P.R.E. Ingersoll Rand.
S. 48B 1 Franklin double stage Air Compressor.
W 39A 1—Laidlow 2 stage tandem compound horizontal steam driven Air Compressor.
Ch. 28B 1—150 Cubic Ft Sullivan.
CL. 57B 1—Chicago Pneumatic 1,200 Cubic Feet steam driven cross compound, 2 stage.

Air Compressor --- Electric

B 13B 1—1,100 Cubic Ft. Class WN, No. 3 Sullivan Angle Compound, 20″ and 12″ x 14″; direct connected to 225 H.P., 2,200 V, 214 R.P.M., 3 phase, 25 cycle, Electric Machinery Synchronous Motor with exciter.

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Grinders

Ch. 23A 2—12″ Willey double Emery Wheel Grinders.
D 100A 1—Drill and Cutter Grinder. Wilmarth and Morman Co. Mfrs. Serial No. 10.-602—JBX.
D. 19A 1—Combination Cutter and Grinders, Wilmarth and Morman Yankee.
D. 102A 1—Yankee Drill Grinder and Cutter.
D. 47A 1—Grinding Machine, No. 5 Ransome.
D. 49A 1—No. 8B Ransome Dry Tool Grinder.
D. 76B 1—Double Emery Grinder.

Locomotives

L 12A 1—48-ton Schenectady Locomotive, 4 wheel type, 4′ drivers, 46½x16′ boilers, air brakes.
D 118A 1—Plymouth 6-ton Gasoline Locomotive

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10′ to 16′ extension type, swings 11′ 2″-20′ 2″.
60″ x 5′ horizontal, back geared.
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42″ x 12′ horizontal, back geared.
42″ vertical car wheel boring and facing machine.
34″ London, vertical.

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11′ Bertram, rail type, 6 spindle, adjustable heads.
Gardam, multiple, medium capacity, 6-spindle.
D-8 Colburn, heavy duty, B.G.
No. 16D "Hole Hog" multiple, 4-spindle.
D-4 Colburn, heavy duty.
No. 4 Colburn, heavy duty, B.G.
20″ Barnes, 3-spindle manufacturers.
20″ Colburn, 4-spindle, heavy duty, B.G.
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17½″ Allen, sensitive, 4, 5 or 6-spindles.
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25—Bench drills, from 6″ to 15″ capacity.
14—Post drills, from 12″ to 21″ capacity.
12′ and 14′ arm, wall radials.
8′ semi-universal radial.
5 Radials, from 30″ to 52″ capacity.

GRINDERS

2—No. 106 Rivett, automatic internal.
No. 2½ Bath, duplex internal.
No. 205 Rivett, radial.
No. 3 Brown & Sharpe, universal with internal attachment.
No. 200 Heald, ring and surface, 8″ magnetic chuck.
No. 3 Gardner, disc, 14″ ring wheel chuck.
No. 2 Cincinnati, 12″ x 36″ plain.
2—10″ x 30″ Landis, plain.
2—12″ x 36″ Landis, plain.
18″ x 7′ Stringertype surface.
4—Twist drill grinders.
4—Plain surface grinders.
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7—Plain tool grinders.
30—Pedestal, various makes and sizes.
10—Bench, various makes and sizes.
2—Electric grinders.

GEAR MACHINES

No. 6 Fellows gear shaper, 26″-36″ capacity.
36″ Fellows gear shaper.
No. 2 Barber-Coleman hobber, 3″ x 7″ capacity.
No. 1 Farwell gear hobber.
24″ Brown & Sharpe, automatic spiral gear cutter.
12″ Rochester, gear tooth rounder.

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1500-lb. Bement, steam driven.
700-lb. Bertram, steam driven.
350-lb. Sellers, steam driven.
800-lb. board lift, drop.
40-lb. Bradley, helve hammer.
2—No. 4-A High Speed riveting hammers.
Pettingell base plate.

KEYSEATERS

No. 0 Chattanooga.
No. 1 Davis.

TURRET LATHES

10—No. 6-A Potter & Johnston, automatic.
10—No. 4 Foster, friction head.
26—No. 4 Wood, friction head, tilted turret.
No. 4 Warner & Swasey, universal.
No. 3-A Warner & Swasey, hollow hexagon.
2—No. 3 Foster, plain head.
41—2¼″ Gridley, single spindle, automatic.
2¼″ Cleveland, automatic.
4—¾″ National, multiple spindle, automatic.
2—⅞″ x 2½″ Brown & Sharpe, automatic screw machine.
2—2″ x 24″ Jones & Lamson, flat turret.
2—27″ x 10′ C.M.C., heavy duty.
6—26″ x 10′ Steinle, geared head.
4—24″ x 9′ Gisholt, B.G., friction head.
50—Other turret lathes of various makes and sizes.

ENGINE LATHES

130—Engine lathes of various makes and sizes from 8″ to 32″ swing.
24″ x 12′ Advance, D.B.G.
21″ x 12′ Sidney, D.B.G.
20″ x 12′ Lodge & Shipley, selective head.
2—18″ x 10′ Sidney, medium pattern, manufacturing.
18″ x 10′ 3″ Lodge & Shipley, D.B.G., 3-step cone.
16″ x 5′ Reed, automatic, single pulley drive.
3—16″ x 8′ Sidney, D.B.G.
16″ x 8′ South Bend, quick change gear.
14″ x 6′ Mulliner, tool room lathe, with pan, taper attachment, draw-in attachment.
14″ x 6′ Sidney, quick change gear.
No. 504 Rivett precision, bench type.
No. 505 Rivett precision, bench type.

GAP LATHES

30″ x 44″ x 23′ London, B.G.
26″ x 44″ x 20′ Bertram, B.G.
24″ x 44″ x 16′ or 20′ bed, C.M.C.
22″ x 40″ x 14′ Rae, D.B.G.
18″ x 32″ x 10′ McDougall, D.B.G.
13″ x 20″ x 5′ back geared.

MILLING MACHINES

N. 2 Cincinnati, vertical, high power.
No. 3 Brown & Sharpe, universal.
No. 3 Cincinnati, universal, cone type.
No. 2 Cincinnati, universal, cone type.
No. 2-M Cincinnati, universal.
No. 1½ Cincinnati, universal, cone type.
No. 2 Owen, universal.
No. 1-M Cincinnati universal.
No. 2 Lincoln type.
No. 1 Brown & Sharpe plain oil pan, pump and pipe.
2—18″ Cincinnati, plain, B.G.
2—No. 6 Whitney hand millers.
14—No. 1 Burke bench millers.
Nos. 3 & 4 Thurston die millers with die sinking attachment.
No. 3 Becker-Brainard vertical milling attachment.
14—Thread millers.

IRON PLANERS

36″ x 36″ x 10′ x 12′ Belmer-Eames, 4 heads.
30′ x 12′ x 8½′ Smith & Tannant, 29′ x 8′ table.
60″ x 40″ x 10′ London, 2 heads.
40″ x 37″ x 12′ Fitchburg.
38″ x 38″ x 7½′ London.
36″ x 36″ x 10′ Gray, 2 heads.
32″ x 32″ x 10′ Gray, 2 heads.
30″ x 30″ x 8′ Gray.
26″ x 26″ x 8′ Putnam, 2 heads.
24″ x 24″ x 6′ London.
20″ x 20″ x 5′ London.

PRESSES

5— No. 857 Toledo drawing presses.
No. 355 Toledo drawing press.
Zeh & Hahnemann, horizontal, B.G.
No. 2-C Consolidated, inclinable.
5—Brown-Boggs, power presses.
8—Bliss, power presses.
3—20-ton garage screw presses.
5—No. 0 Hercules, bench, power.

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Bertram double end punch and shear, 42″ throat, capacity of punch 1½″, shear 8″.
Edwards double end punch and shear, capacity of punch 2″ shear 6″ x 6″.
1″ Cleveland style "C", single end punch.
1″ Bertram, horizontal punch.
No. 5 Pels, universal, portable punch.
6″ x 6″ Bertram, double angle shear.
3/4″ Lennox, rotary plate bevelling shear.
No. 214 Stoll, rotary, circle and slitting shear.

SHAPERS

2 24″ back geared with swivel vise.
7 16″ back geared.
10″ x 54″ traverse head.

MISCELLANEOUS

18—Arbor presses.
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24″ Stockbridge Back Geared Crank Shaper.
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Many Other Bargains. Send Us Your Inquiries.

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Lathes

1—26″ x 12′ Pond Lathe, S.B.G., C.R., P.C.F.
1—24″ x 12′ New Haven Lathe, D.B.G., S-Q.C.G., C.R.
1—24″ x 12′ Can. Mach. Lathe, S.B.G., C.R., P.C.F.
2—22″ x 10′ Davis Lathes, D.B.G., Q.C.G., C.R.
1—22″ x 10′ Rahn-Larmon Lathe, S.B.G., S-Q.C.R., C.R.
1—21″ x 10′ London Lathe, S.B.G., C.R., P.C.F.
4—20″ x 8′ C.M.C. Lathes, D.B.G., S-Q.C.G., C.R.
3—18″ x 8′ C.M.C. Lathes, D.B.G., Q.C.G., C.R.
1—18″ x 10′ Butler Lathe, D.B.G., Q.C.G., C.R.
1—18″ x 8′ London Lathe, S-Q.C.G., D.B.G., C.R.
1—16″ x 6′ McDougall Lathe, S.B.G., S-Q.C.G., C.R.
1—18″ x 8′ Mueller Lathe, D.B.G., Q.C.G. Turret on cross slide.
1—14″ x 6′ Flather Lathe, S.B.G., Q.C.G., C.R.

Shapers

1 16″ Butler Shaper.
1 12″ Port Hope Shaper.

Drills

1—No. D-1 H.D. Colburn Drill.
2 No. 24 H.D. Foote Burt Drills.
1 28″ Barnes Drill, B.G., P.F.
1—22″ Barnes Drill, B.G., P.F.
3—20″ McDougall Drills, W. & L.F.

Miscellaneous

2 2″ x 26″ Pratt & Whitney Turrets.
1 No. 2 Gardner Disc Grinder.
1 20″ Acme Belt Cutter.

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Machinery and Equipment For Sale At Bargain Prices

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1—20 H.P. Westinghouse Motor, 25 Cy., 550 V., 710 R.P.M.
1—20 H.P. Westinghouse Motor, 25 Cy., 550 V., 1420 R.P.M. Above complete with Pulley, Base and Starters.
2—5 H.P. Crocker-Wheeler Motors, 25 Cy., 550 V., 1500 R.P.M.
1—Dumore Tool Post Grinder, complete.
1—Pyrometer—Tycos Type Multiple Indicating.
1—Pyrometer Tycos Type Recording Indicating.
1 Pyrometer Tycos Type Portable.
1—Mephisto Arc Welder, 150 Amps.
1—Arnold Electric Portable Drill.

Engine Lathes

2—Stevens—18″ x 8′, complete with Countershaft.
2—Bridgeford 26″ x 12′ Bed, Quick Change Gears, Double Back Gears and Countershaft.
1—Putman—18″ x 8′, complete with Countershaft.
1—Putman—26″ x 14′, complete with Countershaft.

Turret Lathes

8—Wood Machine Co.—Tilted Turret Lathe. Size 4, complete with Wire Feed and Collet System. Power Feed to Turret and Countershafts.
2 Jones & Lamson's Turrets, 3″ x 36″, Hardness Flat Turret. Complete with Countershaft.
15—Blowers—all different sizes for Cupola, Ventilating and Exhaust Work.

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2—30″ London Machine Tool.
1—42″ Bullard.
1—44″ Bertram.

Horizontal Boring Mills.

1—4″ Bar, Beaman & Smith. floor type.
2—4″ Bar, Bertram, elevating table.

Bolt and Nut Machines.

1—2-Spindle Nut Tapper, ½″.
1—½″ to 2″ Bolt Cutter.
1—¾″ National Nut Forging Machine.
1—2″ Acme Bolt Header.
1—4-Spindle Bertram Nut Tapper.
1—Blake & Johnson Thread Rolling Machine.
1—¼ x ½″ Pawtucket Cold Nut Press.

Boring Bar.

1—8″ x 7′ Canada Foundry.

Blowers.

1—No. 4 Roots Pressure Blower.
2—27-Cubic-foot Connersville.

Drilling Machines.

1—12″ Perfect Sensitive.
1—14″ Excelsior.
1—20″ Bertram, sliding head.
2—20″ MacGregor-Gourlay.
1—25″ W. F. & J. Barnes.
1—20″ Prentice.
1—3′ Gang Radial.
1—3½′ Stevens Hamilton Radial.
1—5′ Western Radial.
1—6′ Western Radial.
1—5′ Bickford Full Universal Radial.
1—4′ London Semi-Universal Radial.
1—6-Spindle Crosby Mud Ring.
2—12′ MacGregor-Gourlay Plate Radial.
1—3′ MacGregor-Gourlay Wall Radials.

Grinders.

18—Miscellaneous Pedestal Emery Grinders.
1—8″ Goddard Ring Grinder.
1—40″ Canada Foundry Piston Ring Grinder.

Hydraulic.

1—150-ton Hydraulic Wheel Press, 46″.
1—No. 2 W. H. Wood Joggling Machine.
12—Hydraulic Forging Presses, 200 to 350-ton.

Plate Planer.

1—18′ Niles.

Rotary Planer.

1—36″ Bertram on turntable.

Lathes.

2—16″ x 6′ Canedy-Otto.
1—16″ x 6′ MacGregor-Gourlay.
1—16″ x 8′ Cleveland.
3—14″ x 5′ Bertram.
2—16″ x 6′ London.
1—16″ x 8′ Lodge-Shipley.
1—15″ x 8′ LeBlond.
1—18″ x 12′ Bertram.
1—20″ x 8′ MacGregor-Gourlay.
1—20″ x 10′ London.
1—18″ x 6′ Bertram.
1—20″ x 10′ Boye & Emmes.
1—20″ x 10′ Bertram.
1—26″ x 16′ Bertram.
1—24″ x 20′ Stevens.
1—26″ x 12′ Fitchburg.
1—26″ x 18′ Bullard.
1—24″ x 12′ Schumacher & Boye.
1—40″ x 18′ London.
1—20″ x 34″ x 10′ London Gap.
1—18″ London Fox Turret.
3—No. 4 Bartons & Oliver Turrets.
8—6A Potter & Johnson.
6—1½″ Wood Turret Lathes.
5—16″ Bawden Single Purpose.
1—100″ Bertram Wheel Lathe.
1—Bertram Axle Lathe.

Milling Machines.

1—No. 13 Brainard Universal.
1—No. 2 London Plain.
1—No. 3 Cincinnati Plain.
1—No. 3 Bertram Plain.
1—42″ Newton Vertical.
1—24″ Bertram Slab Miller.
1—40″ Bertram Slab Miller.
1—54″ Newton Slab Miller.

Metal Planers.

1 30 x 30 x 10′ London.
1—30 x 30 x 8′ Bertram.
1—40 x 40 x 10′ Bertram.
1—87 x 60 x 16′ London.
1—48 x 48 x 14′ Stirk.
1—106 x 84 x 28′ Bertram.

Plate Rolls.

1—27′ Allis-Chalmers Plate Bending Rolls, 27″ diameter, top roll, capacity 1¼″ plate.
1—9′ 6″ Bertram Plate Straightening Rolls, 12″ diameter, rolls 1″ plate.
1—8′ Smith Bros. Plate Straightening Rolls, 10″ diameter, rolls 1″ plate.

Bull Riveters.

1—42″ Hanna.
1—36″ Hanna.
1—36″ Allan.
1—24″ Allan.
1—18″ Allan.
1— 9″ Allan.

Iron Shapers.

1—20″ Bertram.
1—20″ Hendey.
1—24″ Morton.
1—30″ Morton.
1—14″ Bertram Traverse.
1—16″ Hand Traverse.
1—16″ Broadbent Traverse.

Slotting Machines.

1—10″ Crosby with rotary table.
1—24″ Bertram, triple head for locomotive frame.

Saws.

10—Racine Saws, 6″ and 10″ cap.
1—No. 1 Newton Cold Saw.

Woodworking Machinery.

1—MacGregor-Gourlay Rip and Cross-cut Saw.
1—32″ Crescent Band Saw.
1—24″ MacGregor-Gourlay Planer and Matcher.
1—12″, 4-side MacGregor-Gourlay Moulder.
1—MacGregor-Gourlay 54″ Band Resaw.
1—MacGregor-Gourlay 4′ x 8′ Door Clamp.
1—MacGregor-Gourlay 42″ x 6′ Sash Clamp.
1—MacGregor-Gourlay 6″ 4-side Sticker.
1—MacGregor-Gourlay 48″ 3-drum Sander.
1—MacGregor-Gourlay Mortiser.
1—MacGregor-Gourlay Horizontal Borer.
1—MacGregor-Gourlay 5″ Tenoner.
1—MacGregor-Gourlay Railway Cut-off.
1—MacGregor-Gourlay, 2-Spindle Shaper.
1—MacGregor-Gourlay 20″ Wood Lathe.
1—MacGregor-Gourlay 16″ Buzz Planer.
1—Foy-Egan 12″ Buzz Planer.
1 MacGregor-Gourlay "Daniels" Timber Planer.

Miscellaneous.

23—Miscellaneous Toledo Presses.
2—2″ Pipe Machines.
2—4″ Pipe Machines.

Punches and Shears.

1—Cleveland Beam Punch and Coping Machine, 31″ throat, 24″ beams.
1—Bertram, double end, 1″ x 1″, 32″ throat.
1—Long & Allstatter Bending Machine, 15″ beams and channels.
1—1¼ x 1″ Cleveland Horizontal Punch.
1—8 x 8 Bertram Angle Shear.
1—Hillis & Jones Splitting Shear, capacity 1″.
1—Bertram Beam Coping Punch, 24″ beams.
1—Bertram Double End Punch and Shear, 1″ x ¾″, 30″ throat.
1—T-40 Pells Beam Shear, 15″ beams and channels.
1—Double End Corbett, ½ x ½ x 24″ throat.
1—Double End Long & Allstatter, ¾″ x 1, 18″ throat.
1—Double End Smith, 1″ x 1″, 30″ throat.
1—Single End C.M.C., 1″ x 1″, 30″ throat.
1—60″ C.M.C. Gate Shears, 1″ capacity.
1—¾″ Wagner Rotary Shear.

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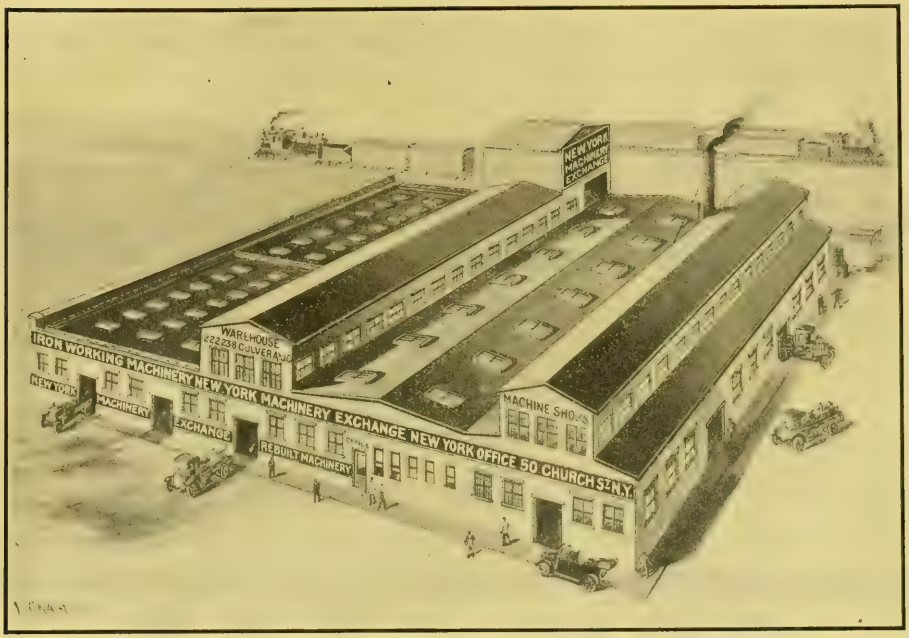

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For Bar Work, complete with full tool equipment, capacity 1⅝" x 24".

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One Goldie-McCulloch Jerome-Wheelock 13" x 33" Horizontal Steam Engine, in first-class condition.

One No. 389 Webster Feed Water Heater and Purifier, complete with all fittings.

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Hoyt Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.

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Madison Mfg. Co., Muskegon, Mich.

Bars, Boring, Portable
Underwood Corp., H. B., Philadelphia, Pa.

Bars, Bronze Cored
Moore & Son, Thos., Montreal, Que.

Bars, Iron
Steel Co. of Canada, Ltd., Hamilton, Ont.

Bars, Steel
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Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
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Ontario Metal Products Co., Ltd., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

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Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
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Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
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Wright Mfg. Co., Lisbon, Ohio.

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Can. Fairbanks-Morse Co., Ltd., Montreal.
Ford Chain Block Co., Philadelphia, Pa.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio

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Fisher Motor Co., Ltd., Orillia, Ont.
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Can. Link-Belt Co., Toronto, Ont.

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National Machinery Co., Tiffin, Ohio.
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National Acme Co., Cleveland, Ohio.

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Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio
N. S. Steel Co., Ltd., New Glasgow, N.S
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Bolt Threading Die Heads
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

Boosters
Sturtevant Co., B F., Boston, Mass

Boring and Turning Mills, Vertical
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.

Boring, Drilling and Milling Machines, Horizontal
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa.

Boring, Drilling and Milling Mach., Vertical
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Boring Heads
Aikenhead Hardware Ltd., Toronto, Ont.

Boring Tools
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill
Gisholt Machine Co., Madison, Wis.

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Volta Mfg. Co., Welland, Ont.

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Ontario Metal Products Co., Ltd., Toronto, Ont.

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Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que

Broaching Machines
Bilton Machine Co., Bridgeport, Conn
Garlock-Walker Mchy. Co., Toronto, Ont

Bronze
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

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British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
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Bucket Carriers, Pivoted
Can. Link-Belt Co., Toronto, Ont.

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Blount Co., J. G., Everett, Mass.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.
U.S. Electrical Tool Co., Cincinnati, O

Bulldozers
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont

Burners, Oil and Gas
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W. S., New York City.

Bushings
Fisher Motor Co., Ltd., Orillia, Ont
Morrow Screw & Nut Co., Ltd., John Ingersoll, Ont.

Cabinets, Oil
S. F. Bowser & Co., Ltd., Toronto, Ont

Calipers
Brown & Sharpe Mfg. Co., Providence, R.I
Starrett Co., L. S., Athol, Mass

Cams
Canada Foundries & Forgings Co., Welland, Ont.

Can-Making Machinery (See Sheet Metal Working Machinery
Bliss Co., E. W., Brooklyn, N.Y
Brown Boggs & Co., Ltd., Hamilton, Ont
MacKinnon Steel Co., Sherbrooke, Que

BUYERS' DIRECTORY

Union Carbide Co. of Can., Ltd., Welland, Ont.

Cars, Ore
MacKinnon Steel Co., Sherbrooke, Que.

Castings, Aluminum
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Brass and Bronze
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Copper
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Marine
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Castings, Die Molded
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Ferro-Alloy
Can. Steel Foundries, Montreal, Que.

Castings, Iron
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia.
Hanna & Co., M. A., Cleveland, Ohio.
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Castings, Hyd. Press
Can. Steel Foundries, Montreal, Que.

Castings, Monel Metal
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

Castings, Naval Bronze
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Nichrome
Can. Driver-Harris Co., Walkerville, Ont.

Castings, Nickel
Can. Hanson & Van Winkle Co., Toronto, Ont.

Castings, Semi-Steel
Davidson Mfg. Co., Thos., Montreal, Que.
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont.
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

Castings, Steel
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

Cements, Iron
Smooth Mfg. Co., Jersey City, N.J.

Centering Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

Chains (See Sprockets and Chains)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

Chains, Driving
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glasco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

Chasers
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chemists
Toronto Testing Laboratory, Toronto, Ont.

Chucking Machines
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Chucks, Drill
Jacobs Mfg. Co., Hartford, Conn.

Chucks, Drill and Tap
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

Chucks, Lathe
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

Chucks, Magnetic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chucks, Planer
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Chucks, Vertical Boring Mill
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Clamps, Machinists'
Columbia Hdwe. Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Cleaners, Metal, Waste, General
Oakley Chemical Co., New York, N.Y.

Clocks, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Clutches, Friction
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

Coal and Ash Handling Machinery
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Coal-Storage Systems
Can. Link-Belt Co., Toronto, Ont.

Collars, Shaft or Set
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

Collets
Ackworthle, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Compounds, Carburizing, Case Hardening and Tempering
Cataract Refining Co., Toronto, Ont.

Compounds, Cleaning
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont
Oakley Chemical Co., New York, N.Y.

Compounds, Cutting, Drilling, Grinding, Screw Cutting
Atkins & Co., Inc., E. C., Indianapolis, I.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Compressors, Air
Curtis Pneumatic Machinery Co., St. Louis, Mo

Compressors, Air and Gas
Can. Fairbanks-Morse Co., Ltd., Montreal.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Petrie, Ltd., H. W., Toronto, Ont.

Cones, Friction
Norton Co. of Can., Ltd., Hamilton, Ont.

Connecting Rods and Straps
Canada Foundries & Forgings Co., Welland, Ont.

Contract Work
Ford-Smith Machine Co., Hamilton, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo
Victoria Foundry Co., Ltd., Ottawa, Ont.

Conveyors and Elevators (See Elevators)
Jones & Glassco, Montreal, Que.
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

Conveyor Belt Joiners
Flexible Steel Lacing Co., Chicago, Ill.

Copper
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Cored Bronze Bars
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Cotter Pins
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Counterbores
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Counters, Revolution
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Countershafts
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

Countersinks
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Couplers, Car and Locomotive
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont

Couplings, Flexible
Holden Co., Ltd., Montreal, Que.

Couplings, Rigid
Bernard Industrial Co., A., Fortierville, Que.

Couplings, Shaft
Bilton Machine Co., Bridgeport, Conn
Can. Link-Belt Co., Toronto, Ont.

Cranes, Electric
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

Cranes, Hand (See Hoists, Hand)
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Sheffield Engineering Supplies, Ltd., Montreal, Que.

Cranes, Locomotive
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Cranes, Traveling
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Crank Pin Turning Machines
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

Cutters, Flue
Holden Co., Ltd., Montreal, Que.

Cutters, Gear
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, High Speed
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Milling
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Milling Machine Co., Cleveland
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

Cutters, Stay Bolt
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Thread
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa

Cutting-Off Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I
Garlock-Walker Mchy. Co., Toronto, Ont
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Cutting-Off Machines, Pipe (See Pipe-Cutting and Threading Machines)
Landis Machine Co., Inc., Waynesboro, Pa
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Cutting-Off Tools
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

Cutting Oil Filters (See Oil Filtering Systems)
Bowser, S. F., & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

Cutting, Oxy-Acetylene
Carter Welding Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

Cutting, Oxy-Hydrogen
National Electro Products, Ltd., Toronto, Ont.

Dealers, Machinery (See Searchlight Section)
Ford-Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.

Deckle Straps
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Diamonds, Black and Rough
Joyce-Koebel Co., Inc., New York, N.Y.

Diamond, Carbon and Bortz
Joyce-Koebel Co., Inc., New York, N.Y.

Diamond Tools
Aikenhead Hardware Ltd., Toronto, Ont
Can. Desmond-Stephan Co., Hamilton Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

Diamond Crossings
Can. Steel Foundries, Montreal, Que.

Die-Castings
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Dies, Pipe-Threading
Jones & Lamson Machine Co., Springfield, Vt.

Die Sinking Machines, Automatic
Jones & Lamson Machine Co., Springfield, Vt.
Walcott Lathe Co., Jackson, Mich.

Die Sinkers
Kimber & Hilliler, St. Catharines, Ont.

Dies, Screw and Thread Cutting
Ackworthle, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.

Dies, Sheet-Metal and Sub-Press (See Tool Work)
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Toledo Machine & Tool Co., Toledo, Ohio.

BUYERS' DIRECTORY

Dies, Forging
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hilliker Mfg. Co., St. Catharines, Ont.

Dies, Hammer
Kimber & Hiller, St. Catharines, Ont.

Dies, Self-Opening, Adjustable
Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Dies, Threading-Opening
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Disc Cement
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

Dividing Heads
Ackworthie, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Dogs, Lathe and Milling Machine
Armstrong Bros. Tool Co., Chicago, Ill.

Drafting Boards and Tables
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

Drafting Materials
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

Dressers, Grinding Wheel
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich.

Drill Holders
Armstrong Bros. Tool Co., Chicago, Ill.

Drill Rods
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Drill Speeders
Canada Machinery Corp., Galt, Ont.

Drilling Machine Heads
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

Drilling Machines, Automatic
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

Drilling Machines, Bench
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Electric and Hand
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Gang
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drilling Machines, Heavy Duty
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Holly, R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Multiple Spindle
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
National Acme Co., Cleveland, Ohio.
National Automatic Tool Co., Richmond, Ind.
Terry & Co., John C., Birmingham, Eng.

Drilling Machines, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Drilling Machines, Portable
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Radial
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Drilling Machines, Sensitive
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Turret
Gisholt Machine Co., Madison, Wis.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery Co., A. R., Toronto, Ont.

Drilling Machines, Vertical
Aurora Tool Works, Aurora, Ind.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Hoosier Drilling Mach. Co., Goshen, Ind.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Rockford Lathe & Drill Co., Rockford, Ill.
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Sturtevant Co. of Can., Ltd., Chas. A., Windsor, Ont.

Drills, Center
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drills, High Speed Twist
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Drills, Twist and Flat
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

Dust Handling Equipment
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Electrical Instruments
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que

Electrical Supplies
Atkins & Co., Inc., E. C., Indianapolis, I
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O

Elevating Trucks (See Trucks)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Elevators and Conveyors
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Jones & Glassco, Montreal, Que
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que
Matheson Gravity Carrier Co., Port Hope, Ont.

Emery Wheels (See Grinding Wheels)
Aikenhead Hardware Ltd., Toronto, Ont
Atkins & Co., Inc., E. C., Indianapolis I
Can. Hart Products, Ltd., Hamilton, Ont.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

Engines, Capstan
Kennedy & Sons, Wm., Owen Sound, Ont

Engineers, Mechanical
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif

Expanders, Tube
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que
Jardine & Co., A. B., Hespeler, Ont
Petrie, Ltd., H. W., Toronto, Ont.

Eyeglasses, Safety (See Goggles, Safety)
Prest-O-Lite Co. of Can., Toronto, Ont
Wilson Goggles, Inc., Reading, Pa.

Fans, Electric
Can. Blower & Forge Co., Ltd., Kitchener
Can. Fairbanks-Morse Co., Ltd., Montreal
Northern Electric Co., Montreal, Que
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass

Fans, Exhaust
Can. Blower & Forge Co., Ltd., Kitchener
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Fans, Ventilating
Can. Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Petrie, Ltd., H. W., Toronto, Ont
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que

File Handles
Ingersoll File Co., Ltd., Ingersoll, Ont

Files and Rasps
Atkins & Co., Inc., E. C., Indianapolis I
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont
Simonds Canada Saw Co., Montreal, Que.

Filing Machines
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Filler, Iron (See Cements, Iron)
Smooth Mfg. Co., Jersey City, N.J.

Fire Extinguishers
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Fittings, Pipe
International Malleable Iron Co., Guelph, Ont.

Flexible Shafts
Aikenhead Hardware Ltd., Toronto, Ont.

Flux, Galvanizing
British Smelting & Refining Co., Ltd., Montreal, Que.

Fluxes, Welding
L'Air Liquide Society, Toronto, Ont.

Forging Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

Forgings, Drop
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

Forgings, Hammer
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn, Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Foundry Equipment
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

Foundry Supplies
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Frogs, Spring or Rigid
Can. Steel Foundries, Montreal, Que.

Fuel Oil Burning System
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Electric
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Heat Treating Coal
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

Furnaces, Heat Treating Oil and Gas
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furnaces and Ovens, Electric
Electric Furnace Construction Co., Philadelphia, Pa.
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furnaces, Tempering and Annealing
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furniture, Machine Shop
Garlock-Walker Mchy. Co., Toronto, Ont.

Gages, Comparator
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif
Starrett Co., L. S., Athol, Mass.

Gages, Measuring (See Tool Work)
Chesterman & Co. Ltd., J. Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

Gages, Recording
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

BUYERS' DIRECTORY

Gages, Snap, Thread and Cylindrical
Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Gages, Special Measuring (See Tool Work)
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Gages, Standard
Armstrong Whitworth Co. of Can., Ltd. Montreal, Que.
Atkins & Co., Inc., E. C., Indianapolis, Johansson Inc., C. E., Windsor, Ont.

Gages, Thread
Ackworthie, Ltd., John, Birmingham, Eng.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont.
Starrett Co., L. S., Athol, Mass.

Garnet, Emery and Flint Paper and Cloth
Ritchey Supply Co., Toronto, Ont.

Gas, Coal Compressed
L'Air Liquide Society, Toronto, Ont.

Gas, Compressed
Prest-O-Lite Co. of Can., Toronto, Ont.

Gaskets
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co., Jersey City, N.J.

Gear Blanks
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

Gear-Cutting Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I
Can. Fairbanks-Morse Co., Ltd., Montreal.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

Gear Testing Machines
Brown & Sharpe Mfg. Co., Providence, R.I
Ford-Smith Machine Co., Hamilton, Ont.

Gears, Cast
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

Gears, Cut
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Gears, Dressed
Kennedy & Sons, Wm., Owen Sound, Ont

Gears, Forged
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Gears, Herringbone
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

Gears, Machine Moulded
Can. Steel Foundries, Montreal, Que.

Gears, Rawhide (See Gears, Cut)
Hamilton Gear & Machine Co., Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

Gear, Silent Chain
Gardner & Son, Robt., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Can. Link-Belt Co., Ltd., Toronto, Can.
Hans Renold of Canada, Ltd., Montreal, Quebec.

Gears, Worm
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

Generators, Acetylene
L'Air Liquide Society, Toronto, Ont.

Generators, Electric
Holden Co., Ltd., Montreal, Que.
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Goggles, Safety
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co., Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

Grab Buckets
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Grease Cups, Pressed Steel and Brass
Can. Winkley Co., Ltd., Windsor, Ont.

Greases, Lubricating
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

Grinding Discs
Ritchey Supply Co., Toronto, Ont.

Grinding Machines
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

Grinding Machines, Abrasive Belt
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Automatic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Bench
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Streiinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Grinding Machines, Center
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis

Grinding Machines Chaser
Jones & Lamson Machine Co., Springfield, Vt

Grinding Machines, Cutter and Reamer
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Cylindrical
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Die
Jones & Lamson Machine Co., Springfield, Vermont
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

Grinding Machines, Disc
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Drill
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Face
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Floor and Tool
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Grinding Machines, Internal
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Portable
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Power Oscillating Tool
Herbert Ltd., Alfred, Toronto, Ont.

Grinding Machines, Ring Wheel
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Snagging
Blount Co., J. G., Everett, Mass.
Ford Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Surface
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machinery, Tool Post
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Universal
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Redford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

Grinding Wheels
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

Guards, Emery Wheel
Ford Smith Machine Co., Hamilton, Ont.

Guards, Machinery and Window
Can. Wire & Iron Goods Co., Hamilton, Ont.

Guards, Electric Lamp
Flexible Steel Lacing Co., Chicago, Ill.

Gun-Barrel Machinery
Steinle Turret Machine Co., Madison, Wis

Hack Saws, Power
Ackworthie, Ltd., John, Birmingham, Eng
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I
Clawson Bros., Hamilton, Canada
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Hammers, Chipping
Cleveland Pneumatic Tool Co., Toronto, Ont.

Hammers, Drop
Bertram & Son Co., Ltd., The John, Dundas, Ont
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

Hammers, Electric
Aikenhead Hardware Ltd., Toronto, Ont
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

Hammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Keller Pneumatic Tool Co., Grand Haven, Mich.

Hammers, Power
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Hammers, Rivetting
Cleveland Pneumatic Tool Co., Toronto, Ont.

Hangers, Shafting
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Hardening, Case-Hardening and Tempering
Hamilton Gear & Machine Co., Toronto, Ont.

Hardness Testing Apparatus
Shore Instrument Co., Jamaica, N.Y.

Heating
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.

Hobbing Machines
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Hobs
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd. Dundas, Ont.

Hoists, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

Hoists, Hand
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

Hoists, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Holders-On, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Hose, Flexible Steel
Can. Fairbanks-Morse Co., Ltd., Montreal.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Hose, Industrial
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Hose, Rubber
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

Hydraulic Leather
Graton & Knight Mfg. Co., Worcester, Mass

Hydraulic Machinery
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot

Hydrogen
National Electro Products, Ltd., Toronto, Ont

Index Centers
Dickow, Fred. C., Machinery Co., Chicago, Ill.

Igniters, Gas Engine
Canada Foundries & Forgings Co., Welland, Ont.

Indicators, Speed and Test
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

Insulation
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Jacks, Hydraulic
Norton, A. O., Boston, Mass.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que
Crescent Machine Co., Ltd., Montreal, Q

BUYERS' DIRECTORY

Jigs and Fixtures (See Tool Work)
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Keyseating Machines
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Keys, Machine
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

Knives, Machine
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

Knurl Holders
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lacing Leather
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

Lamps, Electric
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

Lathe Attachments
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ort.

Lathe Pans, Portable
Canada Machinery Corp., Galt, Ont.

Lathe Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

Lathes, Automatic and Semi-Automatic
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Bench
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lathes, Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Engine
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Extension and Gap
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Lathes, Heavy Duty Projectile Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Riabbill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio.
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Horizontal Turret
Acme Machine Tool Co., Cincinnati, Ohio
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Polishing (See Polishing and Buffing Machines)
Ford-Smith Machine Co., Hamilton, Ont.

Lathes, Relieving
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

Lathe, Universal Hand
Brown & Sharpe Mfg. Co., Providence, R.I.

Lathes, Screw-Cutting
Jones & Lamson Machine Co., Springfield, Vt.

Lathe, Speed and Hand
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy. Co., Grand Rapids, Mich

Lathes, Spinning
Terry & Co., John C., Birmingham, Eng.

Lathes, Threading
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

Lathes, Vertical Turret
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

Lathes, Wood Turning
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Lead Pipe
Steel Co. of Canada, Ltd., Hamilton, Ont.

Lighting Fixtures
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont

Linoleum Mill Machinery
Bertrams Ltd., Edinburgh, Scotland.

Liquid Air Plants
L'Air Liquide Society, Toronto, Ont.

Lockers, Clothes
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

Lubricants
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Lubricating Systems
Bowser, S. F., & Co., Ltd., Toronto, Can.

Machinists' Small Tools
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Manganese Steel
Can. Steel Foundries, Montreal, Que.

Mandrels, Expanding
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Mandrels, Solid
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Twist Drill Co., Cleveland, O.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Measuring Machines
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Metals, Alloy
British Smelting & Refining Co., Ltd. Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Metalite Cloth
Ritchey Supply Co., Toronto, Ont.

Micrometer Calipers
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

Milling Attachments
Ackerthle, Ltd., John, Birmingham, Eng
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Milling Machines
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Co., Ltd., Montreal.

Milling Machines, Automatic
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Bench
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng

Milling Machines, Hand
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

Milling Machines, Horizontal and Planer Type
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal Q
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont
Gooley Eclund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Milling Machines, Plain
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont
Gooley Eclund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Milling Machines, Universal
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont
Garlock-Walker Mchy. Co., Toronto, Ont
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

Milling Machines, Vertical
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Rockford Milling Machine Co., Rockford, Ill.
Williams Machinery Co., A. R., Toronto, Ont.

Monel Metal
International Nickel Co. of Can., Ltd., Toronto, Ont.

Motors, Electric
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que.
Northern Electric Co., Moutreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis.

Moulded Rubber Goods
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Nail Machinery
Sleeper & Hartley, Inc., Worcester, Mass.

Nails and Staples
Steel Co. of Canada, Ltd., Hamilton, Ont.

Nickel, Bars, Sheets, Wire, Etc.
International Nickel Co. of Can., Ltd., Toronto, Ont.

Nickel Plating Outfits
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Nickel Silver
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Nitrogen
L'Air Liquide Society, Toronto, Ont.

Nut Tappers (See Bolt and Nut Machinery)
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

Nuts, Finished and Semi-finished
Galt Machine Screw Co., Galt, Ont.

Nuts, Machine Screw
Torrington Company, Ltd., Upper Bedford, Que.

Nuts, S.A.E., Plain and Castellated
Galt Machine Screw Co., Galt, Ont.

Oil Filtering and Storage Systems
Bowser, S. F., & Co., Ltd., Toronto, Can.

Oil Storage Engineers
Bowser, S. F., & Co., Ltd., Toronto, Can.

Oils
Canadian Oil Companies, Ltd., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oil Hole Covers
Can. Winkley Co., Ltd., Windsor, Ont.

Oils, Soluble
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oxygen
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

Oxy-Acetylene Apparatus
L'Air Liquide Society, Toronto, Ont.

Packing, Hydraulic
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

Packing, Steam
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

Paper Mill Conveyors
Bertrams Ltd., Edinburgh, Scotland.

Patents
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que

Pans, Wet and Dry
Frost Mfg. Co., Chicago, Ill.

Pattern-Shop Machinery (See Woodworking Machinery)
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Patterns, Wood and Metal
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

Penstocks, Steel
MacKinnon Steel Co., Sherbrooke, Que

BUYERS' DIRECTORY

Phosphor Tin
British Smelting & Refining Co., Ltd., Montreal, Que.

Photographic Duplicating Machines
Commercial Camera Co., Providence, R.I.

Pig Iron
Steel Co of Canada, Ltd., Hamilton, Ont.

Pipe Bending Machines
American Pipe Bending Machine Co., Boston, Mass
Can. Fairbanks-Morse Co., Ltd., Montreal.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

Pipe Couplings
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Cutting and Threading Machines
Can. Fairbanks-Morse Co., Ltd., Montreal.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Pipe and Nipple Threading Machines
Landis Machine Co., Inc., Waynesboro, Pa.

Pipe Fitters' Tools
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Pipe Threading Die Heads
Landis Machine Co., Inc., Waynesboro, Pa.

Piston-Ring Machines
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Planers, Parallels
L. & P. Mfg. Co., Niagara Falls, Ont.

Planing Machines
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg. Co., Niagara Falls, Ont.
Morton Mfg Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Planing Machines, Rotary
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

Plate Rolls
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Pneumatic Tools
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Polishing and Buffing Machines
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Pots, Steel
Swedish Crucible Steel Co of Canada, Ltd., Windsor, Ont.

Pressed Steel Parts
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

Presses, Arbor
Atlas Press Co., Kalamazoo, Mich.
Can. Fairbanks-Morse Co., Ltd., Montreal
L. & P. Manufacturing Company, Ltd., Niagara Falls, Ont.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Streliinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

Presses, Drop and Forging
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Foot and Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

Presses, Forcing
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

Presses, Hydraulic
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg. Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot
Williams Machinery Co., A. R., Toronto, Ont.

Presses, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Screw
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Profiling Machines
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Protractors
Brown & Sharpe Mfg. Co., Providence, R.I.

Propellers
Kennedy & Sons, Wm., Owen Sound, Ont.

Pulleys, Cork Insert
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

Pulleys, Metal and Fibre
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Pulp and Paper Mill Equipment
MacKinnon Steel Co., Sherbrooke, Que.

Pumps, Automobile Tire
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Pumps, Barrel and Boiler-feed
Trahern Pump Co., Rockford, Ill.

Pumps, Circulating and Coalant
Trahern Pump Co., Rockford, Ill

Pumps, Geared and Hand
Trahern Pump Co., Rockford, Ill.

Pumps, Industrial
Trahern Pump Co., Rockford, Ill.

Pumps, Hydraulic
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot
Trahern Pump Co., Rockford, Ill.

Pumps, Lubricant and Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

Pumps, Power
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal. Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

Punches, Center
Brown & Sharpe Mfg Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

Punches, Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Jardine & Co., A. B., Hespeler, Ont.

Punches, Power
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

Punching Machines, Horizontal
Bertrams Ltd., Edinburgh, Scotland.

Pyrometers, Electric
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Racks, Cut
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

Racks, Storage (See Furniture, Machine Shop)
Brantford Oven & Rack Co., Brantford, Ont.

Rammers, Foundry
Holden Co., Ltd., Montreal, Que

Reamer Holders
Cleveland Twist Drill Co., Cleveland, O
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

Reamers, Expanding
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Reamers, Solid
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Reamers, Taper
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Recorders, Temperature
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Recorders, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Regulators, Automatic (for electric furnaces)
Volta Mfg. Co., Welland, Ont.

Rheostats
Northern Electric Co., Montreal, Que

Resistance Materials
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Respirators
Willson Goggles, Inc., Reading, Pa.

Rivets
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

Rivet Heaters
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

Rivet-Making Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

Riveting Machines
Bilton Machine Co., Bridgeport, Conn.
Can. Fairbanks-Morse Co., Ltd., Montreal
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

Rolling Mill Equipment
Stewart & Co., Duncan, Glasgow, Scot.

Rolls (Rubber Covered)
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Rudder Frames, Steel
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Rubber Goods, Mechanical
Quaker City Rubber Co., Philadelphia, Pa

Rules, Steel
Chesterman & Co., Ltd., J., Sheffield, Eng

Rules, Steel and Wood
Brown & Sharpe Mfg. Co., Providence, R.I.

Rust Preventatives
Oakley Chemical Co., New York, N.Y.

Sand Equipment
Can. Link-Belt Co., Toronto, Ont.

Sand Mills
Frost Mfg. Co. Chicago, Ill.

Sanding Machinery
Oliver Machy. Co., Grand Rapids, Mich.

Sand Rammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Saw Frames and Blades, Hack
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que

Sawing Machines, Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Sawing Machines, Power Hack
Ackworthie, Ltd., John, Birmingham, Eng
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Co., Ltd., Montreal
Williams Machinery & Supply Co., A. R., Montreal, Que.

Saw Sharpening Machines
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saw Tables, Universal
Atkins & Co., Inc., E. C., Indianapolis, I
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Saws, Circular Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hand
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

Saws, Hot and Cold
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

Saws, High Speed Steel
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Metal Band
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saws, Metal, Power
Clemson Bros., Inc., Hamilton, Ont.

Saws, Metal Cutting
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

Saws, Milling
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Saws, Screw Slotting
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que

Saws, Swing Cut-off
Oliver Machinery Co., Grand Rapids, Mich

Scales
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal. Q

Screens
Can. Wire & Iron Goods Co., Hamilton, Ont.

Screw Drivers, Optical, Jewelry and Novelty
Torrington Co., Ltd., Upper Bedford, Que.

Screw Driving Machine
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill

Screw Extractors
Cleveland Twist Drill Co., Cleveland, O

Screw Machine Work
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co, Hamilton, Ont.

BUYERS' DIRECTORY

Screw Machinery, Wood and Lag
Cook Co., Asa S., Hartford, Conn.

Screw Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Screw Machines, Automatic
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

Screw Machines, Plain or Hand
Acme Machine Tool Co., Cincinnati, Ohio
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio

Screw Machine Products
Torrington Company, Ltd., Upper Bedford, Que.

Screw Plates
Alkenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

Screws, Cap and Set
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Lock Cap
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Machine
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Safety Set
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Screws, Side Knob
Torrington Company, Ltd., Upper Bedford, Que.

Screws, Thumb
Torrington Company, Ltd., Upper Bedford, Que.

Second-Hand Machinery
(See Searchlight Section)
Petrie, Ltd., H. W., Toronto, Ont.

Separators, Moisture and Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Separators, Oil and Waste
Bowser, S. F., & Co., Ltd., Toronto, Can.

Shafting
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Shapes, Cold-Drawn Special Steel
Union Drawn Steel Co., Hamilton, Ont.

Shaping Machines
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Shapers, Wood
Oliver Machinery Co., Grand Rapids, Mich.

Shears, Hand
Can. Blower & Forge Co., Ltd., Kitchener.

Shears, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Stuart & Co., Duncan, Glasgow, Scot
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.

Shearing Machines, Angle, Iron Bar and Gate
Bertrams Ltd., Edinburgh, Scotland.

Sheet Metal Working Machinery
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

Sheets, Nickel, Resist, Alloy
International Nickel Co. of Can., Ltd., Toronto, Ont.

Sheets, Nickel, Monel and Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Side Frames, Locomotive
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Slotting Attachments
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Rockgsmith Mfg. Co., Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

Slotting Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

Solders
British Smelting & Refining Co., Ltd., Montreal, Que.
Hoyt Metal Co., Toronto, Canada.

Snap Flasks
Oliver Machy. Co., Grand Rapids, Mich.

Special Machinery and Tools
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

Specialties, Swaged and Headed Work
Torrington Company, Ltd., Upper Bedford, Que.

Spectacles, Industrial
Willson Goggles, Inc., Reading, Pa.

Springs
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

Spring-making Machinery
Sleeper & Hartley, Inc., Worcester, Mass.

Sprockets and Chains
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Squares
Brown & Sharpe Mfg. Co., Providence, R.I.

Stamping, Metal
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Stamps, Steel
Diamond Saw & Stamping Works, Buffalo, N.Y.

Stairways, Wrought Iron
Can. Wire & Iron Goods Co., Hamilton, Ont.

Steam Specialties
Crane Ltd., Montreal, Que.

Steel Plate
Dom. Foundries & Steel, Hamilton, Ont.

Steels, Tool
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel Blooms and Billets
Steel Co. of Canada, Ltd., Hamilton, Ont.

Steel, Cold-Rolled Strip
Andrews Steel Co., Newport, Ky.
Barnes Co., Wallace, Bristol, Conn.
Can. Drive-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Steel Castings
Dom. Foundries & Steel, Hamilton, Ont

Steel Forgings
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Steel, Shafting and Free Cutting Screw
Barnes Co., Wallace, Bristol, Conn
Can. Drawn Steel Co., Hamilton, Ont.
Union Drawn Steel Co., Hamilton, Ont.

Steel, Sheet
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

Steel, Tanks
Can. John Wood Mfg. Co., Toronto, Ont.

Steel, Stainless
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel Wire Rods
Steel Co. of Canada, Ltd., Hamilton, Ont.

Steels, Alloy, Open Hearth and Electric
United Alloy Steel Corp., Canton, Ohio.

Steels, Alloy and Carbon
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steels, High-Speed
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel, Magnet
Can. Atlas Crucible Steel Co., Toronto, Ont
Vanadium Alloys Steel, Latrobe, Pa.

Steel, Structural
MacKinnon Steel Co., Sherbrooke, Que.

Steel Tubing, Close Joint and Welded
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

Stern Frames, Cast Steel
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Straightening Machinery
Bertrams Ltd., Edinburgh, Scotland.

Studs
Galt Machine Screw Co., Galt, Ont.

Surface Plates
Bilton Machine Co., Bridgeport, Conn.

Swaging Machines
Atkins & Co., Inc., E. C., Indianapolis, I

Switches, Railway
Can. Steel Foundries, Montreal, Que

Switches and Switchboards
Northern Electric Co., Montreal, Que.

Tablets, Bronze, Memorial
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Tachometers
Alkenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

Tanks, Steel
MacKinnon Steel Co., Sherbrooke, Que.

Tanks and Pumps, Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

Taper Cutting Dies
Jones & Lamson Machine Co., Springfield, Vt.

Tap Holders
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Taper Pins
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Tapes, Measuring
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

Tapping Machines and Attachments
Ackworthe, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Taps and Dies
Ackworthe, Ltd., John, Birmingham, Eng
Butterfield & Co., Inc., Rock Island, Que
Can. Fairbanks-Morse Co., Ltd., Montreal.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Taps, Collapsing
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

Teeth, Dredge Bucket
Kennedy & Sons, Wm., Owen Sound, Ont.

Testing Metals and Materials
Toronto Testing Laboratory, Toronto, Ont

Thermometers
Bristol Co., Waterbury, Conn.

Thread-Cutting Tools
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Thread Cutting Machines
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

Threaded Wires
Torrington Company, Ltd., Upper Bedford, Que.

Threading Machines
Acme Machinery Co., Cleveland, Ohio.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
William Tool Corp. of Can., Ltd., Brantford, Ont.

Thread Lead Testing Machines
Jones & Lamson Machine Co., Springfield, Vt.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Thread-Rolling Machines
Bliss Co., E. W., Brooklyn, N.Y.

Tongs
Hepburn Ltd., John T., Toronto, Ont.

Tool Cases
Rice Lewis & Son, Ltd., Toronto, Ont.

Tool Holders
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Markers, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Tool Posts, Lathe
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Steels for all Purposes
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Tools, Small (See Machinists' Small Tools)
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que.
Can. Fairbanks-Morse Co., Ltd., Montreal.
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strellinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Tool Work
Brown Engineering Corp., Ltd., Toronto
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont

BUYERS' DIRECTORY

Torches, Blow
National Electro Products, Ltd., Toronto Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

Trackwork, Railway
Can. Steel Foundries, Montreal, Que.

Trackwork, Manganese Steel
Can. Steel Foundries, Montreal, Que.

Transformers
Northern Electric Co., Montreal, Que

Transmission Machinery
Bernard Industrial Co., A., Fortierville Que
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont.
Renold (Hans) of Canada, Ltd., Montreal Que.

Transportation Systems (See Trucks)
Mathews Gravity Carrier Co., Port Hope, Ont.

Treated Bits
Can. Atlas Crucible Steel Co., Toronto Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Trolleys and Tramways
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont
Wright Mfg. Co., Lisbon, Ohio.

Trucks
Can Fairbanks-Morse Ltd., Montreal Q
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

Trucks, Industrial Motor
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

Tube, Products
Tube Co. of Canada, Toronto, Ont.

Tubing, Electric Welded or Oxy-Acetylene Welded
Tube Co. of Canada, Toronto, Ont.

Tubing, Flexible
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Tubing, Seamless Steel
Tube Co. of Canada, Toronto, Ont.

Tubing, Seamless Steel, Brass and Copper and Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Ontario Metal Products Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Tubing, Welded
International Nickel Co. of Can., Ltd., Toronto, Ont.
Ontario Metal Products Co., Ltd., Toronto, Ont.

Tubing, Welded Steel
Tube Co. of Canada, Toronto, Ont.

Turbines, Water
Kennedy & Sons, Wm., Owen Sound, Ont.

Turret Heads
Ackworthie, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Turret Machines (See Lathes, Horizontal Turret)
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis
Warner & Swasey Co., Cleveland, Ohio.

Turrets, Tool Post
Gisholt Machine Co., Madison, Wis.

Unions, Pipe
Crane Ltd., Montreal, Que.

Universal Joints
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

Valves
Can Fairbanks-Morse Ltd., Montreal Q
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.

Vises, Drilling Machine
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

Vises, Metal Workers'
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O

Vises, Milling Machine
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.

Voltmeters
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que

Wagon Loaders
Can. Link-Belt Co., Toronto, Ont.

Washers
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co,, Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont
Torrington Company, Ltd., Upper Bedford, Que.

Welding Machines, Oxy-Acetylene
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

Welding, Oxy-Acetylene
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

Welding Rod, Tobin, Manganese Bronze and Aluminum
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Welding Supplies
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

Wheels, Cast, Steel
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Wheels, Industrial
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

Winches, Electric
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

Winches, Headgate
Kennedy & Sons, Wm., Owen Sound, Ont.

Winches, Stoplog
Kennedy & Sons, Wm., Owen Sound, Ont.

Wire
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.

Wire Cloth
Can. Wire & Iron Goods Co., Hamilton, Ont.

Wire Coiling Machinery
Sleeper & Hartley, Inc., Worcester, Mass.

Wire Rope
Can. Wire & Iron Goods Co., Hamilton, Ont.

Wire Straightening and Cutting Machinery
Baird Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont
Schuster Co., F. B., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

Wire, Welding
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Wires, Special
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Woodworking Machinery
Canada Machinery Corp., Galt, Ont.
Can. Fairbanks-Morse Co., Ltd., Montreal
Garlock-Walker Mchy. Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Wrenches, Drop Forged
Armstrong Bros. Tool Co., Chicago, Ill
Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Machinists'
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Pipe
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.

Wrenches, Tap
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont

Wrought Iron Pipe
Steel Co of Canada, Ltd., Hamilton, Ont

DIRECTORY OF DEALERS

THE Buyers' Directory of CANADIAN MACHINERY was originally intended to contain information regarding lines actually manufactured by our advertisers. We now carry the advertising of leading machinery dealers, some of whom represent scores of manufacturers in addition to being manufacturers themselves in some cases. This necessarily widened the scope of our Directory, but it would be impracticable to list all the lines handled by all the dealers. We recommend, therefore, if our subscribers cannot find what they want in our Directory that they communicate with the dealers whose names appear herewith.

MACHINE TOOLS AND METAL WORKING EQUIPMENT

Chas. P. Archibald & Co., Montreal, Que
The Canadian Fairbanks-Morse Co., Montreal, Que
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont.

MACHINE SHOP AND FACTORY SUPPLIES

Chas. P. Archibald & Co., Montreal Que
The Canadian Fairbanks-Morse Co Montreal, Que.
The Garlock-Walker Machinery Co., Toronto, Ont.
R. S. Holly, Toronto, Ont.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co., Montreal, Que.
Chas. A. Strelinger Co. of Canada Limited, Windsor, Ont.
A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Montreal, Que.
Wilson-McGovern Limited, Toronto Ont.
Yeates Machinery Co., London, Ont

POWER EQUIPMENT AND SUPPLIES

The Canadian Fairbanks-Morse Co., Montreal, Que.
MacGovern & Co., Montreal, Que.
H. W. Petrie Limited, Toronto, Ont.
The Standard Equipment & Tool Co Montreal, Que
Wilson-McGovern Limited, Toronto, Ont.
A. R. Williams Machinery Co., Montreal Que

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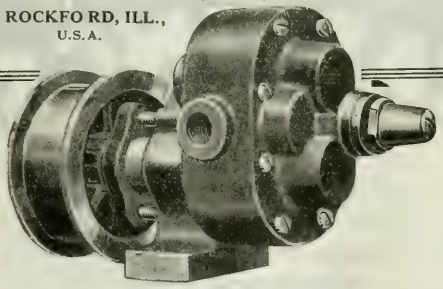

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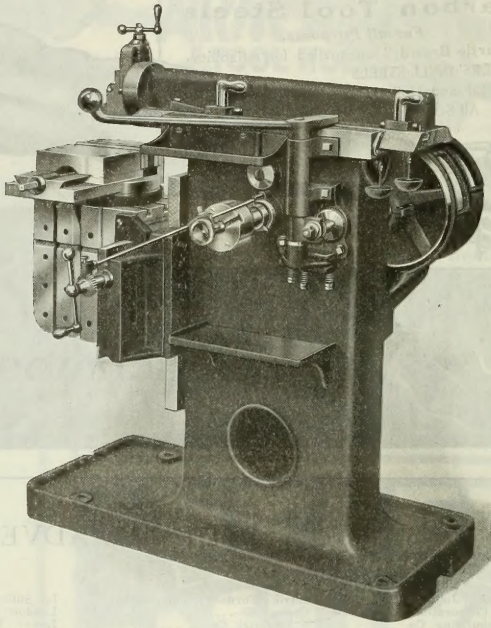

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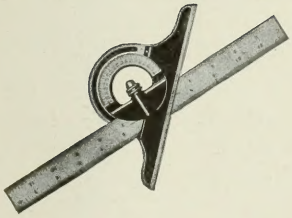

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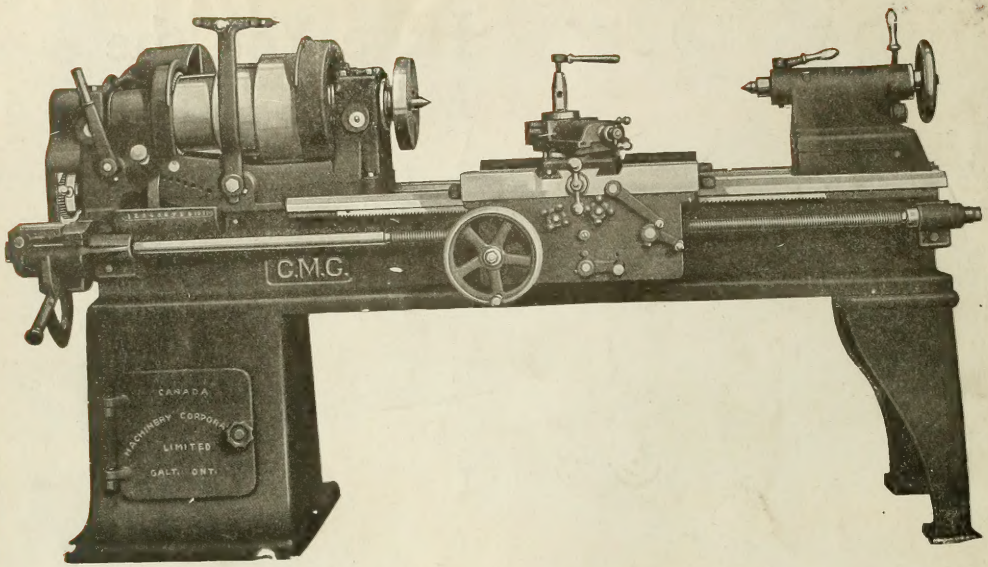

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